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(Series initiated by V. L. Komarov)

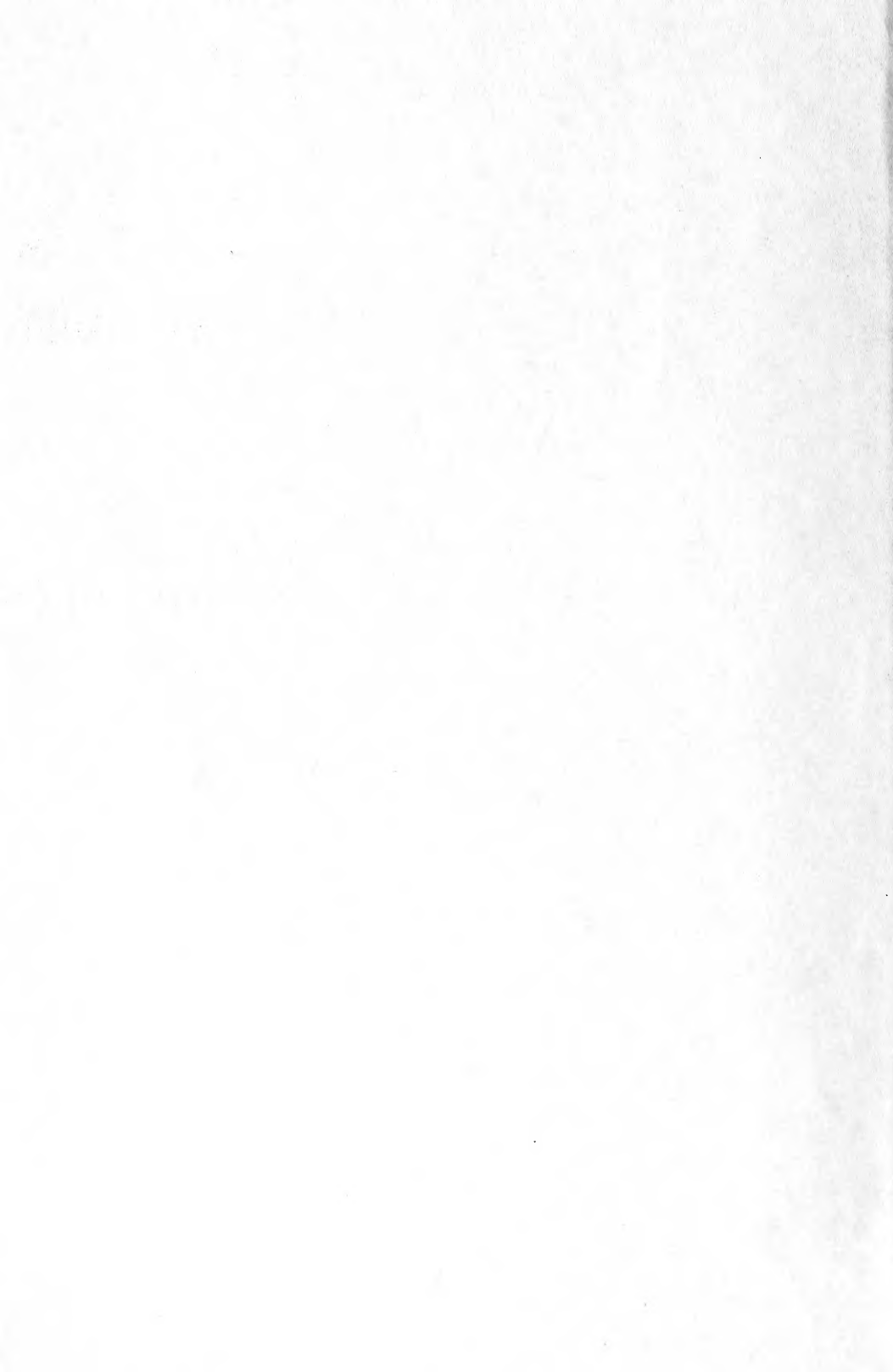
Volume XVIII

Edited by B.K. Shishkin and E.G. Bobrov

Metachlamydeae

TRANSLATED FROM RUSSIAN

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The Botanical Institute im. V.L. Komarov of the Academy
of Sciences of the U.S.S.R.

Академия Наук СССР. Ботанический институт

FLORA OF THE U.S.S.R.

(Flora SSSR)

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Vol. XVIII

Metachlamydeae

Editors of Volume XVIII

B.K. Shishkin and E.G. Bobrov

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TABLE OF CONTENTS

	Russian page*	English page
Preface.		1
Subclass II. Metachlamydeae Engl. seu Sympetalae Eishl.	1	3
Key to Orders of Dicotyledonous Sympetalae.	1	3
Key to Families of Sympetalae	2	4
Order 31. Ericales Lindl.	7	7
Family CXXI. Pyrolaceae Lindl.	7	8
Genus 1084. <i>Pyrola</i> L.	8	8
Genus 1085. <i>Moneses</i> Salisb.	14	13
Genus 1086. <i>Ramischia</i> Opiz.	15	14
Genus 1087. <i>Chimaphila</i> Pursh	17	15
Family CXXII. Monotropaceae (Nutt.) Lindl.	19	16
Genus 1088. <i>Monotropa</i> Nutt.	19	17
Genus 1089. <i>Hypopitys</i> Adans.	20	18
Family CXXIII. Ericaceae DC.	22	19
Subfamily I. Rhododendroideae	26	22
Genus 1090. <i>Botryostege</i> Stapf	26	22
Genus 1091. <i>Ledum</i> L.	27	23
Genus 1092. <i>Rhododendron</i> L.	31	25
Subgenus I. <i>Leiorhodium</i> (Rehd.) Pojark.	34	28
Subgenus II. <i>Osmothamnus</i> Maxim.	40	33
Subgenus III. <i>Rhodorastrum</i> (Maxim.) Drude	46	37
Subgenus IV. <i>Tsutsutsi</i> (G. Don) Pojark.	55	43
Subgenus V. <i>Sciadorhodion</i> (Rehd. et Wils.) Copeland	56	44
Subgenus VI. <i>Pentanthera</i> (G. Don) Pojark.	57	45
Subgenus VII. <i>Therorhodion</i> (Maxim.) Drude	58	46
Genus 1093. <i>Menziesia</i> J.E. Smith	61	48
Subfamily II. Phyllodoceoidae (Drude) E. Busch.	62	49
Genus 1094. <i>Loiseleuria</i> Desv.	62	49
Genus 1095. <i>Phyllodoce</i> Salisb.	63	50
Genus 1096. <i>Bryanthus</i> Stell.	65	51

* [The page numbers of the Russian original appear in the left-hand margin of the text.]

Subfamily III. <i>Andromedaceae</i> (Drude) E. Busch,	66	52
Genus 1097. <i>Cassiope</i> D. Don	66	52
Genus 1098. <i>Harrimanella</i> Cov.	70	55
Genus 1099. <i>Arctericia</i> Cov.	71	56
Genus 1100. <i>Eubotryoides</i> (Nakai) Hara	72	57
Genus 1101. <i>Andromeda</i> L.	74	58
Genus 1102. <i>Chamaedaphne</i> Moench.	75	59
Genus 1103. <i>Epigaea</i> L.	77	60
Subfamily IV. <i>Gaultherioideae</i> (Drude) E. Busch	78	61
Genus 1104. <i>Gaultheria</i> L.	78	61
Subfamily V. <i>Arbutoidae</i> (Drude) E. Busch.	79	62
Genus 1105. <i>Arbutus</i> L.	79	62
Genus 1106. <i>Arcostaphylos</i> Adans.	83	65
Genus 1107. <i>Arctous</i> (A. Gray) Niedenzu	84	66
Subfamily VI. <i>Ericoideae</i> Drude	88	69
Genus 1108. <i>Calluna</i> Salisb.	88	69
Genus 1109. <i>Erica</i> L.	89	70
Genus 1110. <i>Bruckenthalia</i> Rchb.	92	71
Family CXXIV. <i>Vacciniaceae</i> Lindl.	93	72
Genus 1111. <i>Vaccinium</i> L.	94	73
Genus 1112. <i>Oxycoccus</i> Adans.	103	79
Family CXXV. <i>Diapensiaceae</i> Lindl.	105	81
Genus 1113. <i>Diapensia</i> L.	105	81
Order 32. <i>Primulales</i> Lindl.	107	83
Family <i>Myrsinaceae</i> Lindl.	107	83
Genus <i>Ardisia</i>	108	83
Family CXXVI. <i>Primulaceae</i> Vent.	108	83
Tribe 1. <i>Primuleae</i> Rchb.	111	86
Genus 1114. <i>Primula</i> L.	111	86
Subgenus 1. <i>Primulastrum</i> (Duby) Schott.	123	95
Subgenus 2. <i>Auriculastrum</i> Schott.	201	150
Genus 1115. <i>Sredinskya</i> (Stein.) Fed.	202	151
Genus 1116. <i>Kaufmannia</i> Rgl.	203	152
Genus 1117. <i>Dionysia</i> Fenzl.	208	155
Genus 1118. <i>Androsace</i> L.	217	161
Genus 1119. <i>Cortusa</i> L.	242	179
Tribe 2. <i>Soldanellae</i> (Pax) Fed.	249	184
Genus 1120. <i>Soldanella</i> L.	249	184
Tribe 3. <i>Hottonieae</i> (Rchb.) Endl.	251	186
Genus 1121. <i>Hottonia</i> L.	252	186
Tribe 4. <i>Samoleae</i> Rchb.	253	187
Genus 1122. <i>Samolus</i> L.	253	188
Tribe 5. <i>Lysimachieae</i> Rchb.	255	189
Genus 1123. <i>Lysimachia</i> L.	255	189
Genus 1124. <i>Naumburgia</i> Moench.	268	199
Genus 1125. <i>Trientalis</i> L.	269	200
Genus 1126. <i>Asterolinon</i> Hoffmsg. et Link.	272	202

Tribe 6. Glauceae Fed.	273	203
Genus 1127. Glaux L.	273	203
Tribe 7. Anagallideae Rchb.	275	204
Genus 1128. Anagallis L.	275	204
Genus 1129. Centunculus L.	278	206
Tribe 8. Cyclamineae (Rchb.) Pax	279	207
Genus 1130. Cyclamen L.	279	207
Genus 1131. Dodecatheon L.	290	215
Family CXXVII. Plumbaginaceae Lindl.	292	216
Subfamily I. Plumbaginoideae Kuzn.	295	219
Genus 1132. Plumbago L.	295	219
Genus 1133. Plumbagella Spach.	297	220
Subfamily II. Staticoideae Kusn.	298	221
Genus 1134. Acantholimon Boiss.	301	221
Genus 1135. Chaetolimon (Bge.) Lincz.	372	276
Genus 1136. Limonipsis Lincz.	376	279
Genus 1137. Ikonnikovia Lincz.	380	280
Genus 1138. Goniolimon Boiss.	382	282
Genus 1139. Cephalorrhizum M. Pop. et Korov. ...	405	299
Genus 1140. Armenia Willd.	408	301
Genus 1141. Limonium Mill.	411	304
Genus 1142. Psylliostachys (Jaub. et Sp.) Nevski ...	467	343
Order 33. Ebenales Engl.	474	349
Family Sapotaceae Dumort.	474	349
Genus Achras	474	349
Genus Bumelia	474	349
Genus Sapotacites	475	349
Genus Taenioxylon	475	349
Family CXXVIII. Ebenaceae Vent.	475	349
Genus Macreightia	475	350
Genus 1143. Diospyros L.	475	350
Family CXXIX. Oleaceae Lindl.	483	356
Genus 1144. Fraxinus L.	485	357
Subgenus 1. Ornus (DC.) V. Vassil.	487	359
Subgenus 2. Fraxinaster (DC.) V. Vassil.	490	361
Genus 1145. Syringa L.	502	370
Genus 1146. Phillyrea L.	510	375
Genus 1147. Olea L.	512	376
Genus 1148. Ligustrina Rupr.	516	379
Genus 1149. Ligustrum L.	518	381
Genus 1150. Jasminum L.	522	384
Family CXXX. Gentianaceae Dumort.	525	387
Tribe 1. Erythraeinae Gilg.	527	388
Genus 1151. Centaurium Gilib.	527	388
Genus 1152. Blackstonia Huds.	536	394
Tribe 2. Gentianinae Gilg.	536	394

Genus 1153, <i>Crawfurdia</i> Wall.	536	395
Genus 1154, <i>Gentiana</i> L.	538	396
Subgenus 1, <i>Eugentiana</i> Kusn.	539	397
Subgenus 2, <i>Gentianella</i> Kusn.	590	435
Genus 1155, <i>Lomatogonium</i> A. Br.	620	456
Genus 1156, <i>Anagallidium</i> Griseb.	622	458
Genus 1157, <i>Ophelia</i> D. Don.	625	458
Genus 1158, <i>Swertia</i> L.	629	462
Genus 1159, <i>Halenia</i> Borkh.	638	469
Family CXXXI, <i>Menyanthaceae</i> G. Don.	640	470
Genus 1160, <i>Fauria</i> Franch.	641	471
Genus 1161, <i>Menyanthes</i> L.	642	472
Genus 1162, <i>Nymphoides</i> Hill.	643	473
Family CXXXII, <i>Apocynaceae</i> Lindl.	645	474
Genus <i>Apocynophyllum</i>	645	474
Genus <i>Echitonium</i>	645	475
Genus <i>Rauwolfia</i>	646	475
Subfamily 1, <i>Plumierioideae</i> Schum.	646	475
Genus 1163, <i>Vinca</i> L.	646	475
Subfamily 2, <i>Echitoideae</i> Schum.	652	479
Genus 1164, <i>Trachomitum</i> Woodson	652	480
Genus 1165, <i>Poacynum</i> Baill.	660	485
Genus <i>Nerium</i> L.	662	487
Family CXXXIII, <i>Asclepiadaceae</i> Lindl.	663	487
Genus <i>Acerates</i>	663	488
Subfamily 1, <i>Periplocoideae</i> K. Schum.	664	489
Genus 1166, <i>Periploca</i> L.	665	489
Subfamily 2, <i>Cynanchoidae</i> K. Schum.	666	490
Tribe 1, <i>Glossonematinae</i> K. Schum.	667	491
Genus * <i>Araujia</i> Brot.	667	491
Tribe 2, <i>Asclepiadinae</i> K. Schum.	668	491
Genus 1167, <i>Gomphocarpus</i> R. Br.	668	491
Genus 1168, <i>Asclepias</i> L.	669	492
Genus 1169, <i>Pycnostelma</i> Bge.	671	494
Tribe 3, <i>Cynanchinae</i> K. Schum.	672	494
Genus 1170, <i>Metaplexis</i> Bge.	672	495
Genus 1171, <i>Antitoxicum</i> Pobed.	674	496
Genus 1172, <i>Cynoctonum</i> E. Mey.	709	521
Genus 1173, <i>Seutera</i> Rchb.	710	522
Genus 1174, <i>Cynanchum</i> L.	714	524

Addenda XVII (Diagnosis of new species mentioned in Volume XVIII of the Flora of the USSR)	721	528
Index Alphabeticus	767	562
Vegetation Regions of the USSR	798	593
List of Abbreviations		596
Maps		601

SUBJECTS AND CONTRIBUTORS

- Key to orders of gamopetalous dicotyledons. Key
to families of gamopetalous plants. Family
Diapensiaceae Prepared by B.K. Shishkin
- Family Pyrolaceae Prepared by N.A. Bush
- Family Monotropaceae, genus Lomatogonium,
family Menyanthaceae Prepared by E.G. Bobrov
- Key to genera of the family Ericaceae;
genera: Botryostegia, Menziesia,
Eubotryoides, Erica, Bruckenthalia;
subgenera: Rhodorastrum and Tsutsutsi
of the genus Rhododendron and key to
species of this genus Prepared by A.I. Poyarkova
- Genera: Ledum, Rhododendron
(subgenera — Leiorhodium, Osmo-
thamnus, Sciadorhodium,
Pentanthra), Bryanthus, Cassiope,
Harrimanella, Arctica,
Andromeda, Chamaedaphne,
Epigaea, Gaultheria, Arbutus,
Arctostaphylos, Arctostaphylos, Calluna . . . Prepared by E.A. Bush
- Key to genera of the family Primulaceae;
genera: Primula, Sredinskya,
Kaufmannia, Cortusa,
Dodecatheon Prepared by An.A. Fedorov
- Genera: Dionysia, Soldanella, Hottonia,
Samolus Prepared by L.A. Smol'yaninova
- Genus Androsace Prepared by B.K. Shishkin
E.G. Bobrov
- Genus: Lysimachia, Naumburgia,
Plumbagella, Armeria Prepared by E.I. Shteinberg
- Genera: Trientalis, Asterolinon, Glaux,
Anagallis Prepared by S.G. Gorshkova
- Genus Cyclamen, family Apocynaceae,
family Asclepiadaceae Prepared by E.G. Pobedimova

Family Plumbaginaceae, except the genera

Plumbagella, Armeria,

 Psylliostachys Prepared by I. A. Linchevskii

Genus Psylliostachys Prepared by O. I. Rozhkova

Family Ebenaceae Prepared by V. I. Grubov

Family Oleaceae, except the genus Olea V. N. Vasil'ev

Genus Olea Prepared A. G. Borisova

Family Gentianaceae, except the genus

 Lomatogonium Prepared by A. A. Grossgeim

Indications concerning occurrence of

 fossilized plants Prepared by A. N. Krishtofovich

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PREFACE

The present volume initiates the description of families of the subclass Metachlamydeae. Appropriate keys to orders and families are included. It is evident at the present stage that 160 families of vascular plants are represented in our flora.

The most extensive treatment is accorded in this volume to the families Ericaceae, Primulaceae, Plumbaginaceae, Gentianaceae, and Asclepiadaceae. Many innovations have been introduced in the systematics of subdivisions and more than seventy new species have been established; most of these are published in the addendum to this volume. The most substantial alterations have been made in the systematics of Primulaceae (An. A. Fedorov), Plumbaginaceae (I. A. Linchevskii), Gentianaceae (A. A. Grossgeim), and Asclepiadaceae (E. G. Pobedimova).

The families treated in this volume include numerous ornamental herbaceous and shrubby plants as well as woody forms of the family Olivaceae which can be used in protective afforestation and in areas of large-scale hydroconstruction and irrigation projects.

The Editors



Subclass II. **METACHLAMYDEAE** Engl. seu **Sympetalae** Eishl.*

Flowers commonly containing a calyx and a sympetalous corolla; in some species corolla polypetalous or wanting.

Key to Orders of Dicotyledonous Sympetalae**

1. All flowers bisexual, regular or slightly zygomorphic; stamens inserted directly on the receptacle and twice the number of corolla lobes; corolla usually sympetalous, but polypetaly occasionally occurring; anthers opening by two apertures and often prolonged into two appendages; pollen grains predominantly in tetrads Order 31. **Ericales** Lindl.
- + Differing in the various characters 2.
2. Ovary superior or very rarely half-inferior 3.
- + Ovary inferior 8.
3. Stamens 2 or 3 times as many as calyx or corolla lobes Order 33. **Ebenales** Benth. et Hook.
- + Stamens as many as or fewer than corolla lobes 4.
4. Stamens commonly 5, facing corolla lobes 5.
- + Stamens alternating with corolla lobes 6.
5. Ovary many-ovuled; style commonly 1, with a capitate stigma Order 32. **Primulales** Lindl.
- + Ovary 1-ovuled; styles commonly 5. Order 33. [?] **Plumbaginales** Engl.
6. Corolla scarious; stamens 4, inserted on the corolla tube and alternating with its lobes; ovary 2-loculed or incompletely 4-loculed by false partitions; capsule membranous, containing 1 or several seeds in each locule, mostly circumscissile Order 37. **Plantaginales** Engl.
- 2 + Corolla not scarious; capsule dehiscing longitudinally or rarely circumscissile. 7.
7. Flowers actinomorphic; aestivation convolute; ovules many or few; placentation parietal or axial; stamens 4 or 5 Order 35. **Contortae** (L.) Engl.
- + Flowers commonly zygomorphic, rarely subactinomorphic; placentation plicate; ovules many or few; placentation marginal; stamens 4 or 2. Order 36. **Tubiflorae** Agardh.
8. Flowers unisexual, monoecious or dioecious, pentamerous; anthers biloculate, tortuous; 4 of the five stamens coherent in 2 pairs, the

* See: Flora of the U.S.S.R., Vol. V, page 1.

** Arranged by B. K. Shishkin.

- fifth stamen separate, rarely all anthers connate; ovary commonly 3-loculed; herbaceous, often annual plants, trailing by tendrils.
 Order 39. **Cucurbitales** Engl.
- ++ Flowers commonly bisexual; anthers 4-locular, free or coherent; ovary 1-3-loculed. 9.
9. Flowers 5- or 4-merous, actinomorphic, rarely zygomorphic or irregular; stamens and carpels as many as or fewer than corolla lobes; anthers distinct; leaves often opposite or verticillate
 Order 38. **Rubiales** Engl.
- + Flowers commonly 5-merous, with 5 stamens and fewer carpels; anthers mostly coherent; leaves commonly alternate, very rarely opposite Order 40. **Campanulatae** Scop.

Key to Families of Sympetalae*

1. Parasitic or saprophytic plants, devoid of green leaves 2.
- + Plants bearing green leaves 5.
2. Stems cordlike, twining around other plants
 Family CXXXV. **Cuscutaceae** Choisy.
- + Stems erect, not twining 3.
3. Stamens 8-12 Family CXXII. **Monotropaceae** (Nutt.) Lindl.
- + Stamens 4 4.
4. Leaves scalelike, alternate; inflorescence spiciform or rarely, solitary flowers Family CXLVII. **Orobanchaceae** Lindl.
- + Leaves fleshy, opposite; inflorescence racemose, 1-sided
 Family CXLII. **Scrophulariaceae** Lindl. (**Lathraea**).
- 3 5. Ovary superior 6.
- + Ovary inferior or half-inferior 39.
6. Stamens not adnate to corolla or adnate merely at its base 7.
- + Stamens adnate to corolla tube 9.
7. Corolla polypetalous; low perennial herbs, leaves commonly ever-green, crowded on the lower part of the stem
 Family CXXI. **Pyrolaceae** Lindl.
- + Corolla sympetalous, very rarely polypetalous and then plants frutescent 8.
8. Flowers unisexual, the monoecious staminate flowers with a 4-parted calyx, a tubular 4-lobed corolla, and 4 stamens; low herbs
 Family CL. **Plantaginaceae** Lindl. (**Litorea**).
- + Flowers bisexual; stamens 5-8-10; shrubs or subshrubs
 Family CXXIII. **Ericaceae** DC.
9. Stamens twice the number of corolla lobes; fruit fleshy
 Family CXXVIII. **Ebenaceae** Vent.
- + Stamens not more than corolla lobes 10.
10. Stamens facing the lobes of corolla 11.
- + Stamens alternating with lobes of corolla 12.
11. Style 1, undivided; fruit a many-seeded capsule
 Family CXXVI. **Primulaceae** Vent.
- + Style pentafid at summit or styles 5; fruit nutlike, indehiscent
 Family CXXVII. **Plumbaginaceae** Lindl.
12. Pistil composed of 2 1-loculed ovaries. 13.

* Arranged by B. K. Shishkin.

- + Ovary 1 14.
13. Stamens with distinct filaments, the pollen powdery; styles united; stigma oval, pointed at the top and shortly 2-lobed Family CXXXII. **Apocynaceae** Lindl.
- + Stamen filaments connate into a tube enclosing the distinct styles or very rarely the stamens distinct; anthers (tightly adherent to stigma with basal appendages spread out in the mouth of corolla, the pollen agglutinated into masses (pollinia) suspended from or borne on a stalk Family CXXXIII. **Asclepiadaceae** Lindl.
14. Ovary 1-loculed 15.
- + Ovary 2-4-loculed 23.
15. Styles 2 Family CXXXVII. **Hydrophyllaceae** Lindl.
- + Style 1 16.
16. Stamens 2 Family CXLVII. **Lentibulariaceae** Lindl.
- 4 + Stamens 4 or 5 or more 17.
17. Stamens 5, rarely 6-7 18.
- + Stamens 4 19.
18. Petals involute or imbricated in the bud, not plicate; leaves opposite; seedcoat uniform, thin Family CXXX. **Gentianaceae** Dumort.
- Petals induplicate-valvate in the bud; leaves alternate; outer seedcoat ligneous Family CXXXI. **Menyanthaceae** G. Don.
19. Fruit a many-seeded capsule 20.
- + Fruit 1-seeded, nutlike 22.
20. Fruit a large curved ligneous capsule with two long cuneate protuberances Family CXLV. **Martyniaceae** Link.
- + Fruit a 1-loculed capsule without cuneate protuberances 21.
21. Corolla regular Family CXXX. **Gentianaceae** Dumort.
- + Corolla bilabiate Family CXLII. **Scrophulariaceae** Lindl.
22. Annuals; flowers in a loose raceme Family CXLIX. **Phrymaceae** Schauer.
- + Perennials or subshrubs with a capitate inflorescence Family CXLVIII. **Globulariaceae** Link.
23. Corolla scarious, persistent long after flowering; stamens much exerted from the corolla tube; fruit a circumscissile capsule Family CL. **Plantaginaceae** Lindl.
- + Corolla not scarious; stamens commonly included in the corolla tube or barely exerted 24.
24. Ovary 4-lobed or more rarely 2-lobed, the style arising between the lobes; fruit separating into 4 or rarely 2 1-seeded nutlets or drupes 25.
- + Ovary not lobed and surmounted by 1 or several styles, or very rarely ovary and fruit bilobed with style arising between the lobes and then the fruit a many-seeded capsule (**Veronica**) 27.
25. Stamens 2; corolla regular; fruit 2-lobed; a shrub with alternate leaves Family CXXIX. **Oleaceae** Lindl. (**Jasminum**)
- + Stamens 4-5, rarely 2, herbaceous plants 26.
26. Stamens 5; flowers commonly regular, in a helicoid cyme; leaves alternate Family CXXXVIII. **Boraginaceae** Lindl.
- 5 + Stamens 4, didynamous, or only 2; corolla usually bilabiate, and if regular then leaves opposite; flowers in clusters in the leaf axils or in a terminal inflorescence Family CXL. **Labiatae** Juss.
27. Ovary 3-loculed 28.
- + Ovary 2- or 4-loculed, never 3-loculed 29.

28. Flowers subtended by 2 or 3 bracts; nectariferous disk wanting; shrubs small, thick with leathery wintering leaves. Family CXXV. **Diapensiaceae** Lindl.
- + Flowers ebracteate, the cup-shaped nectariferous disk obtusely crenulate-margined; perennials Family CXXXVI. **Polemoniaceae** Juss.
29. Fruit separating into 4 nutlets 30.
- + Fruit not separating into nutlets 31.
30. Stamens 5; corolla regular; flowers in helicoid cymes; leaves alternate. . . Family CXXXVIII. **Boraginaceae** Lindl. (**Heliotropium**).
- + Stamens 4, didynamous; flowers in long spikes; leaves opposite. Family CXXXIX. **Verbenaceae** Juss. (**Verbena**).
31. Stamens fewer than corolla lobes or sepals. 32.
- + Stamens as many as corolla lobes. 38.
32. Leaves alternate or the upper ones sometimes opposite 33.
- + Leaves opposite, sometimes verticillate or the upper ones alternate. 34.
33. Fruit a wingless capsule. Family CXLI. **Solanaceae** Hall. (**Petunia**).
- + Fruit a winged capsule Family CXLIV. **Pedaliaceae** Lindl. (**Niedzwedzkia**).
34. Trees and shrubs 35.
- Herbaceous plants or subshrubs 36.
35. Stamens 2 Family CXXIX. **Oleaceae** Lindl.
- + Stamens 4 Family CXXXIX. **Verbenaceae** Juss. (**Vitex**).
36. Ovary 4-loculed by false septation. Family CXLIV. **Pedaliaceae** Lindl. (**Sesamum**).
- + Ovary 2-loculed 37.
37. Placentation parietal. Family CXLIII. **Bignoniaceae** Pers.
- + Placentation axial. Family CXLII. **Scrophulariaceae** Lindl.
- 6 38. Ovules erect, usually 2 at the base of each ovary. Family CXXXIV. **Convolvulaceae** Vent.
- + Ovules many; placentation axial or parietal 39.
39. Flowers commonly regular or nearly so; leaves alternate; fruit commonly a berry, rarely a capsule Family CXLI. **Solanaceae** Hall.
- + Flowers commonly zygomorphic, rarely regular; fruit a bilocular capsule Family CXLII. **Scrophulariaceae** Lindl.
40. Plants with tendrils and large fleshy usually edible fruit (a gourd), very rarely without tendrils (**Ecballium**) and the inedible fruit; flowers unisexual, monoecious or dioecious Family CLVII. **Cucurbitaceae** Hall.
- + Plants without tendrils; fruit dry or rarely baccate; flowers commonly bisexual 41.
41. Anthers not connate 42.
- + Anthers united into a tube enclosing the pistil 52.
42. All stamens adnate to corolla at the throat; on the tube, or at base. 43.
- + Stamens not adnate to corolla 51.
43. Flowers small, in dense heads subtended by an involucre 44.
- + Flowers not in heads and if aggregated then the inflorescence not involucrate 45.

44. Stamens 4, their filaments connate in pairs; calyx 2-lobed
. Family CLV. **Morinaceae** Van Thieg.
+ Stamens not connate; calyx 4-5-lobed
. Family CLVI. **Dipsacaceae** Lindl.
45. Stamens fewer than corolla lobes 46.
+ Stamens as many as corolla lobes 47.
46. Stamens 2; plants submerged in water
. Family CXLIV. **Pedaliaceae** Lindl. (**Trapella**).
+ Stamens 3, rarely 1; terrestrial plants
. Family CLIV. **Valerianaceae** Dumort.
47. Leaves connected by stipules or in whorls
. Family CLI. **Rubiaceae** Juss.
+ Leaves estipulate, sometimes not in whorls 48.
48. Flowers actinomorphic, in a small head, the terminal flower with a
2-lobed calyx, 4-parted corolla and 3 stamens, the lateral ones with
a 4-lobed calyx, 5-parted corolla and 10 stamens
. Family CLIII. **Adoxaceae** Fritsch.
+ Flowers all alike, not gathered in heads; inflorescence corymbose or
the flowers solitary or rarely paired 49.
49. Ovary fully inferior; fruit a berry; shrubs
. Family CLII. **Caprifoliaceae** Vent.
+ Ovary half-inferior; fruit a capsule; herbaceous plants 50.
50. Stamens facing the corolla lobes; flowers white
. Family CXXVI. **Primulaceae** Vent. (**Samolus**).
+ Stamens alternating with corolla lobes; flowers blue
. Family CXXX. **Gentianaceae** Dumort. (**Fauria**).
51. Stamens as many as corolla lobes
. Family XLVIII. **Campanulaceae** Juss.
+ Stamens twice as many as corolla lobes
. Family CXXIV. **Vacciniaceae** Lindl.
52. Flowers not gathered in a head; corolla irregular; some or all
anthers bearded at the top Family CLIX. **Lobeliaceae** Juss.
+ Flowers in a capitulum or head; corolla commonly regular, rarely
irregular; anthers not bearded at the top
. Family CLX. **Compositae** Vaill.

Order 31. **Ericales** Lindl.

Flowers bisexual; 5- or 4-merous, regular; stamens usually twice as many as corolla-lobes or petals; stamens and corolla inserted at the edge of a nectariferous hypogynous disk; petals sometimes distinct; carpels 4-5 (rarely 2), commonly inserted opposite the petals; ovary superior or inferior, many loculed, with axial placentae; ovules numerous and each with a single integument; style simple; seeds small, containing a straight embryo surrounded by endosperm (in *Pyrolaceae* embryo undifferentiated).

Flowers regular; calyx 5-parted; corolla polypetalous, of 5 petals; stamens twice as many as petals; anthers opening by pores or a transverse slit; pistil 1; ovary superior, 4-5-loculed; hypogynous disk present or wanting; capsules loculicidal, containing numerous small seeds.

Key to Genera

1. A patelliform hypogynous disk present at the base of ovary 2.
- 8 + Hypogynous disk wanting 3.
2. Disk with 10 teeth; flowers greenish-white in a 1-sided raceme; pistil developed; anthers not horned 1086. **Ramischia** Opiz.
- + Disk rib-shaped, coriaceous; flowers pink; stigma subsessile; anthers horned 1087. **Chimaphila** Pursh.
3. Flowers solitary; pistil longer than the stamens; stigma 5-lobed; anther horns rather long 1085. **Moneses** Salisb.
- + Flowers in a raceme; raceme not 1-sided; style long and curved or short and straight; anther horns very short 1084. **Pyrola** L.

Genus 1084. **PYROLA**** L.

L. Sp. pl. (1753) 396; Copeland in Madrono, IX, 3 (1947) 65.

Calyx 5-parted, persistent in fruit; corolla pentapetalous, deciduous; stamens 10, the filaments subulate, glabrous; anthers obtuse, opening by 2 terminal pores, the pollen grains distinct; stigma 5-angled or 5-lobed; capsule cernuous, loculicidal, the margins of valves arachnoid.

A circumpolar boreal genus, penetrating into the Arctic and southward into the Himalayas and the mountains of Mexico. The genus contains up to 20 species.

1. Style short, straight or slightly curved; stamen filaments connivent around the pistil; corolla subglobose, very slightly open 2.
- + Style long, reflexed and then upwardly curved; stamen filaments declined away from the style; corolla wide open 3.
2. Flowers small, not more than 6 mm broad; style not exerted from the almost-closed corolla, not ringed below the style . . . 7. **P. minor** L.
- + Flowers of medium size, up to 8 mm broad; style exerted from the half-open corolla, dilated at the top into a ring 6. **P. media** Sw.
3. Corolla greenish; leaves small; calyx lobes broad and short 4.
- + Corolla white or violet-red; leaves large; calyx lobes oblong 5.
4. Leaves orbicular, sometimes slightly attenuate at summit 1. **P. virescens** Schweigg.
- + Leaves reniform 2. **P. renifolia** Maxim.
5. Raceme long, 8-15-flowered 6.
- 9 + Raceme short, 3-7- (8)-flowered; style slightly curved 5. **P. grandiflora** Rad.

* Prepared by N. A. Bush.

** From Latin *Pyrus*, pear tree, owing to resemblance between the foliage of some species and that of the pear tree.

6. Corolla pure white 3. *P. rotundifolia* L.
 + Corolla, calyx, bracts, and peduncles tinged violet-red
 4. *P. incarnata* Fisch.

1. *P. virescens* Schweigg. Specimen Fl. Erlang. I, Add. (1804) 154; Mansf. in Fedde, Repert. XLIX, 47.—*P. chlorantha* Sw. in Vet. Acad. Stockh. Handl. (1810) 190, tab. 5; Ldb. Fl. Ross. II, 929; Boiss. Fl. or. III, 974; Shmal'g. Fl. II, 186; Kuzn. in Mat. Fl. Kavk. IV, 1, 8; Kom. Fl. Kamch. II, 352; Kryl. Fl. Zap. Sib. IX, 2095.—*Thelasia chlorantha* Alef. in Linnaea, XXVIII (1856) 41.—Ic.: Fl. Yugo-vost. VI, Fig. 549.—Exs.: GRF, No. 1482.

Perennial; rootstock long, branched, slender, developing adventitious roots and aerial stems at the nodes; stems ribbed, sometimes slightly tortuous, (6) 10-30 cm long, commonly reddish, the green basal leaves crowded on the lower part of the scape; basal leaves orbicular, sometimes slightly attenuate at apex, broadly ovate or broadly elliptic or broader than long, emarginate, obscurely crenate, coriaceous, partly evergreen, paler beneath, small, rarely more than 1-2.5 cm long and broad, $\frac{2}{3}$ the length of to equaling the petiole; bracts 1-3, borne higher up the scape, small, linear, attenuated toward the base, scalelike, brownish; raceme loose, 2-9-flowered, 1.5-7 cm long; floral bracts ovate-lanceolate, acuminate, shorter than the pedicels; pedicels 5-10 mm long, arched-recurved in fruit; calyx-lobes broadly ovate, short-acuminate, appressed to corolla, ca. 1.5 mm long, as long as or slightly shorter than broad at base; corolla greenish, wide open, 10-15 mm across, the petals ovate, convergent, 6-8 mm long, (3) 4-5.5 mm broad; style exceeding the corolla, (4) 6-8 mm long, dilated into a ring below the stigma, declined, the anthers somewhat upturned; stigma 5-lobed, straight, narrower than the ring; capsule flattened-globose, 3.5-6 mm long, 6-9 mm broad. June-July.

Woods.—Arctic: Arc. Eur.; European part: Kar.-Lap., Dv.-Pech., Lad.-Ilm., Balt., U.V., V.-Ka., Urals, U. Dnp., M. Dnp., U. Dns., V.-Don, Transv., Bes., Crim.; Caucasus: Ciscauc., Dag., W. and E. Transc.; W. Siberia: all regions; E. Siberia: Yenis., Ang.-Say., Dau.; Far East: Kamch. **Gen. distr.:** Scand., Atl. and Centr. Eur., Med. (N.), Bal. (N.), As. M. (N. Anatolia), N. Am. Described from Germany. Type in Berlin.

2. *P. renifolia* Maxim. Prim. Fl. amur. (1859) 190; Mel. Biol. VIII, 624; Fr. Schmidt, Sachal, No. 312; Kom. Fl. Manch. III, 192.—

- 10 *P. soldanellifolia* H. Andres in Deutsch. Bot. Monatsschr. XXII (1910) 48.—Ic.: Ic. Pl. Japon. (1874) tab. 26; H. Andres, l.c. tab. i, f. 3.—Exs.: GFR, No. 2360.

Perennial; rootstock slender, branched, trailing over the moss; leaves 2-6, crowded at the base of aerial shoots, long-petioled, cordate at base, reniform, irregularly and weakly crenulate, dull, paler beneath; scape 12-21 cm long, erect, naked or bearing a single minute lanceolate bract; flowers 2-6; floral bracts free; pedicels 2-3 times the length of the bracts; bracts 5-8 mm long in fruit; calyx-lobes obtuse, broad, rounded-triangular; petals 5-6.5 mm long, 4-5.5 mm broad, rounded-ovate, spreading in a cuplike fashion, greenish; anthers with a flat appendage at base; style arched-recurved, exceeding the corolla, 8-11 mm long in fruit, the geniculation below the stigma; stigma thickened, with an entire margin, narrower than the ring; capsule 4-4.5 mm long, 6-6.5 mm thick. June.

Shady coniferous and mixed woods, in mossy soil, especially near rotting trunks, in groups. — Far East: Uss., Ze.-Bu., Uda, Sakh. **Gen. distr.:** Manchuria, Korea, Japan (Fujiyama). Described from the Far East. Type in Leningrad.

Note. In the Far East displaces *P. chlorantha* which it closely resembles.

3. *P. rotundifolia* L. Sp. pl. (1753) 396; Ldb. Fl. Ross. II, 928; p.p.; Turcz. Fl. baic.-dah. II, 211, p.p.; Boiss. Fl. or. III, 974; Shmal'g. Fl. II, 187; Kuzn. in Mat. Fl. Kavk. IV, 1, 7; Freyn in Oest. Bot. Zeitschr. 52 (1902) 401; Kom. Fl. Man'chzh. III, 194. — *P. macrocalyx* Ohwi in Acta phytotax. et geob. I (1932) 80. — *P. rotundifolia* subsp. *albiflora* Kryl. Fl. Zap. Sib. IX (1937) 2097. — *P. tianschanica* Poljak. in Byull. Glavn. Bot. Sada, 6 (1950) 55. — Ic. Fedch. and Fler. Fl. Evrop. Rossii, Fig. 594. — *Thelaisia rotundifolia* Alef. in Linnaea, XXVIII (1856) 60. — Exs.: GRF, No. 117.

Perennial; rootstock long, branched, slender, producing adventitious roots and aerial stems at the nodes; caudex ribbed, 15-30 cm long, with a basal rosette of crowded leaves and higher up 1-2 oblong-ovate sheathing, scalelike, brownish bracts; rosulate leaves coriaceous, slightly lustrous, partly evergreen, orbicular to oval, sometimes subcordate at base, obscurely crenate or virtually entire, the blades (2) 3-6 cm long and (1.5) 2.5-5.5 cm broad, the rachis up to twice as long as the petiole, rarely as long or shorter; raceme 6-16 cm long, 8-15-flowered; the flowers spreading or rarely nodding; pedicels about as long as the flowers and equaling or slightly exceeding the imbricated lanceolate subtending bracts; 11 calyx-lobes ovate-lanceolate to lanceolate, 3.5-5.5 mm long, often up to 3.5-5.5 times as long as broad, reflexed at the tip; corolla wide open, 15-20 mm across, white, fragrant (the scent similar to that of the lily of the valley), the petals rather thick, rounded-ovate, obtuse, incurved, 6.5-10 mm long, 4-6 mm broad, $1\frac{1}{2}$ - $2\frac{1}{2}$ or rarely 3 times the length of the calyx lobes; stamens arched toward one side of the corolla (the upper side with the flower in lateral position); style about equaling the petals, 7.5-10 mm or 11-12 mm long (var. *longistyla* N. Busch), deflexed at base and facing the lower part of corolla, the terminal ring broader than the 5-lobed stigma; capsule flattened-globose, (4) 4.5-5 mm long, (6) 7-8 mm broad. June-July.

Woods. — European part: Kar.-Lap., Lad.-Ilm, Dv.-Pech., Balt., U. Dnp., U. Dns., U. V., V.-Ka., M. Dnp., V.-Don, Transv., Urals, Crim. (national forest, rare); Caucasus: Cisc., Dag., W. Transc.; W. Siberia: all regions; E. Siberia: Yenis., Ang.-Say., Dau.; Soviet Central Asia: Ar.-Casp. (N.), Balkh. (E.), Dzu.-Tarb., T. Sh., Pam.-Al. **Gen. distr.:** Scand., Atl. and Centr. Eur., Med. (N.), Bal. (Bulgaria), N. Am., Greenland. Described from Sweden. Type in London.

4. *P. incarnata* Fisch. ex DC. Prodr. VII (1839) 772, pro synon.; Freyn in Oesterr. Bot. Zeitschr. LII, 401; Kom. Fl. Man'chzh. III, 195; Fl. Kamch. II, 351. — *P. rotundifolia* var. *incarnata* DC. l.c. 773; Ldb. Fl. Ross. II, (1846) 928. — *P. rotundifolia* ssp. *incarnata* Kryl. Fl. Zap. Sib. IX (1937) 2097. — Exs.: GRF, No. 1933.

Perennial; rootstock long, slender, branched, producing adventitious buds and aerial stems or leaf rosettes at the nodes; stem ribbed, (6) 15-40 cm long, bearing at base crowded green leaves and higher up

1-2 oblong-ovate sheathing, scalelike; brownish bracts; rosulate leaves coriaceous, somewhat lustrous, partly evergreen, orbicular to rounded-ovate, subcordate at base, obscurely serrulate or virtually entire, (2) 3-6 cm long and (1.5) 2.5-5.5 cm broad, the petiole up to twice as long as or, more rarely, somewhat shorter than to as long as the blade; raceme many-flowered, up to 16 cm long; flowers spreading, rarely nodding; pedicels 6-12 mm long in fruit, equaling to somewhat exceeding the membranous lanceolate subtending bracts; calyx-lobes ovate-lanceolate, 3.5-5.5 mm long, often up to $3\frac{1}{2}$ times as long as broad, reflexed at the tip; corolla wide open, 15-20 mm across, violet-red, the calyx, bracts, pedicels, scapes, and leaf petioles similarly colored; petals rather thick, rounded-ovate, obtuse, incurved, (6) 6.5-10 mm long, $1\frac{1}{2}$ - $2\frac{1}{2}$ to rarely 3 times the length of the calyx-lobes; stamens arched toward one side of the corolla (the upper side with flower in lateral position); anthers violet or yellow (var. *xanthanthera* N. Busch, on the Yenisei); style long, 6-10 mm long, declined at base toward the lower part of the corolla, the terminal ring broader than the 5-lobed stigma; capsule flattened-globose, 4.5-5 mm long, 7-8 mm broad. June-July.

Dark coniferous, pine, or (rarely) deciduous woods. — Arctic: An., Chuk.; European part: Urals; W. Siberia: all regions; E. Siberia: all regions; Far East: Uss., Ze.-Bu., Uda, Okh., Kamch. Described from Dauria. Type in Leningrad.

5. **P. grandiflora** Rad., Diss. 27 (1821) tab. III, f. 2; Kryl. Fl. Zap. Sib. IX, 2099. — *P. rotundifolia* var. *grandiflora* Fern. in Rhodora, VI (1904) 202. — *P. rotundifolia* var. *pumila* Horn. Dansk. oecon., Plantel. ed. 3 (1821) 46; Hook. Fl. bor.-am. II, 46; Ldb. Fl. Ross. II, 928. — *P. pumila* Horn. ex Cham. et Schlecht. in Linnaea, I (1826) 514. — *P. groenlandica* Horn. Fl. Dan. XI (1825) tab. 1817. — *Thelasia grandiflora* Alef. in Linnaea, XXVIII (1856) 68.

Perennial; caudex 8-12 or rarely up to 15 cm long; leaves rigidly coriaceous; 1.5-3 cm long, 1-2 cm broad, petiolate, crowded at the base of the scape; bracts 1-2, broadly ovate, sheathing; flowering raceme fairly loose, 2-4 or rarely up to 5 cm long, 3-8-flowered; flowers suffused with violet-red, the calyx, pedicels, bracts, scapes and leaf petioles similarly colored; calyx-lobes ovate-lanceolate, often obtusish, ca. 3 mm long and 1.25-1.5 mm broad; corolla 15-20 mm in diameter; anthers yellow, less strongly deflexed than in *P. rotundifolia* L., sometimes nearly straight with very slightly curvature.

Tundra region, in dry moss-and-lichen tundra; sometimes in wet or sod tundra, in willow thickets. — Arctic: Nov. Z., Arc. Eur., Arc. Sib., Chuk. **Gen. distr.:** Canada, Arc. Am., Greenland. Described from Labrador. Type in Berlin.

6. **A. media**. Sw. in Vet. Acad. Stockh. handl. (1904) 257, f. 7; Ldb. Fl. Ross. II, 929; Boiss. Fl. or. III, 973; Shmal'g. Fl. II, 187; Kuzn. in Mat. Fl. Kavk. IV, 1, 5; Kryl. Fl. Zap. Sib. IX, 2100. — *Amelia media* Alef. in Linnaea, XXVIII (1856) 30. — Ic.: Fl. Yugo-vost. VI, Fig. 550. — Exs.: GRF, No. 273; Rchb. Fl. Germ. exs. No. 154.

Perennial; rootstock slender, strongly branched, brown, bearing at the nodes adventitious roots and aerial shoots; rosulate leaves coriaceous, often evergreen, orbicular or rounded-oval, obscurely crenate with shallow and broad or sometimes flat crenations, ten veins terminating in minute

mammillae, the petiole usually longer than the blade; scapes 10-33 cm long, bearing a single acute bract at or below the middle and terminating in a raceme; calyx-lobes ovate-lanceolate, acuminate, reddish, often recurved at the tip, the margins not overlapping; corolla white or at base pinkish, half open, subglobose, the petals 6-8 mm long, 4.5-6 mm broad; pedicels (5) 8-9 mm long in fruit; filaments of stamens connivent around the style; style somewhat declined, slightly exserted, the terminal ring usually broader than the 5-lobed tubercular stigma, 3-4.5 (6) mm long in fruit; capsule 4-5 mm long, 6.5-8 mm broad. June-July.

Woods. — European part: Kar. -Lap., Lad. -Ilm., Dv. -Pech., U. V., V. -Ka., Urals, Balt., U. Dnp., U. Dns., M. Dnp., Transv., Crim.; Caucasus: Cisc., Dag., W. and E. Transc.; W. Siberia: Ob (from 60°N), Irt., Alt.; E. Siberia: Yenisei. **Gen. distr.:** Iceland, Scand., Atl. and Centr. Eur., Bal. (Bulgaria). Described from Sweden. Type in Stockholm.

7. **P. minor** L. Sp. pl (1753) 396; Ldb. Fl. Ross. II, 930; Boiss. Fl. or III, 973; Shmal'g. Fl. II, 187; Kom. Kamch. II, 353; Kryl. Fl. Zap. Sib. IX, 2101. — Ic.: Fedch. and Fler. Fl. Evrop. Rossii, 595; Fl. Yugo-Vost. VI, 548. — *Amelia minor* Alef. in Linnaea, XXVIII (1856) 25. — Exs.: GRF, No. 425; Fl. cauc. exs. No. 239.

Perennial; rootstock long, branched, with numerous adventitious roots at the nodes; aerial caudex (7) 12-30 cm long, finely ribbed, sometimes slightly tortuous; leaves rosulate, rarely somewhat scattered, ovate to broadly elliptic, rarely orbicular or rounded-oval, obscurely and bluntly crenulate-serrulate, rather rigid, partly evergreen, the blade 2.5-6 cm long, 1-5 cm broad, equaling to slightly exceeding or sometimes shorter than the petiole; bracts 1-2, narrowly linear, acuminate, scalelike, brownish; raceme rather dense, 7-20-flowered, 2-8.5 cm long, the flowers nodding, the pedicels 3-6 mm long in fruit, the subtending bracts lance-linear membranous; calyx-lobes broadly triangular to broadly ovate, acuminate or subobtus, adhering to corolla, the margins overlapping; corolla white or pinkish, globose, nearly closed, 6-7 mm across, the diameter of fully expanded corolla not exceeding 13 mm; petals ca. 5 mm long, 3-3.5 mm broad, incurved; stamens and style erect, the stamens connivent around the style; style shorter than the ovary, 1-2 mm long, not exserted; stigma broad, 1.5-2 mm in diameter, 5-lobed, the style not ringed below the stigma; capsule 3-5.5 mm long, 3.5-7 mm broad. May-July.

Woods. — Arctic: Arc. Eur., Nov. Z.; European part: Kar. - Lap., Dv. -Pech., Urals, Lad. -Ilm., Balt., U. V., V. -Ka., U. Dnp., U. Dns., Bes., V. -Don, Transv., Crim.; Caucasus: Cisc., Dag., W. and E. Transc.; W. Siberia: all regions; E. Siberia: Yenisei. (from 71°N), Ang.-Say., Dau., Lena-Kol.; Far East: Uss., Uda, Okh., Kamch., Komandorskie Is., Sakh.; Soviet Central Asia: T. Sh. **Gen. distr.:** Scand., Atl. and Centr. Eur., Med. (N.), Bal. - As. Min., Dzu. -Kash., Japan, N. Am., Greenland. Described from Sweden. Type in London.

Genus 1085. **MONESES*** SALISB.

Salisb. in A. Gray, Brit. arrang. II (1821) 403.

Filaments of stamens subulate; anthers terminating in 2 rather long horns, opening by apical pores; style exceeding the stamens; stigma 5-lobed; capsule erect, opening down from the top, the margins of the slits naked; flower solitary, terminal.

A monotypic boreal circumpolar genus.

1. **M. uniflora** (L.) A. Gray, Man. Bot. N.U. St. ed. 1 (1848) 273; Kom. Fl. Kamch. II, 355; Kryl. Fl. Zap. Sib. IX, 2091.—*Pyrola unifolia* L. Sp. pl. (1753) 397 (sphalm. typogr.); Kom. Fl. Man'chzh. III, 190.—*P. uniflora* L. Sp. pl. (1762) 569; Shmal'g. Fl. II, 187; Kuzn. in Mat. Fl. Kavk. IV, 1, 2.—*Moneses grandiflora* Salisb. in A. Gray, Brit. arrang. II (1821) 403; Ldb. Fl. Ross. II, 931.—*Moneses uniflora* Alef. in Linnaea, XXVIII (1856) 72.—Ic.: Fedch. and Fler. Fl. Evrop. Rossii, Fig. 582; Fl. Yugo-Vost VI, Fig. 547.—Exs.: GRF, No. 372 a, b, No. 3093; Fl. cauc. exc. No. 72; Herb. Fl. Cauc. No. 341.

Perennial; rootstock filiform, creeping, ascending at the ends, penetrating the forest humus, bearing adventitious roots and aerial caudices; leaves rosulate, rounded-ovate to suborbicular, cuneate-attenuate at base, serrulate-crenulate, the blade 8-22 mm long and about as broad, the petiole about half as long as to slightly shorter than the blade; scape 3-17 cm long, erect, finely ribbed, minutely papillate on the ribs in upper part; floral bract ovate-lanceolate to lanceolate, incurved, ciliolate-margined; usually inserted on the upper part of the scape, 3-5 mm long; 15 flower terminal, solitary, nodding, very fragrant; calyx pale green or whitish, the lobes rounded-ovate, obtuse, ciliolate-margined, about one-third as long as the petals; corolla white, wide-open, 12-25 mm in diameter, the petals spreading, ovate, 7-10 mm long, 4-7 mm broad; stamens in pairs facing the petals; horns of anthers orange; style straight, $1\frac{1}{2}$ - $2\frac{1}{2}$ times the length of ovary; stigma 3-4 times as broad as the style, with 5 oblong pointed lobes; ovary with 5 nectariferous glands at base; capsule erect, globose, 6-8 mm across, opening from the top downward, the margins of valves naked. June-July.

Chiefly mossy dark coniferous or more rarely wet pine or birch woods.—Arctic: Arc. Eur. (Kolguev Island), Chuk., An.; European part: Kar.-Lap., Dv.-Pech., Lad.-Ilm., Balt., U. Dnp., U.V. V.-Ka., U. Dns., M. Dnp., V.-Don, Transv., Urals; Caucasus: Cisc., Dag., W. and E. Transc.; W. Siberia: all regions; E. Siberia: all regions; Far East: Ze.-Bu., Uss., Uda, Sakh., Okh., Kamch.; Soviet Central Asia: Dzu.-Tarb., T.Sh. (Alma-Ata area); Gen. distr.: Scand., Atl. and Centr. Eur., Med. (N.), Bal., Dzu.-Kash., N. Mong., Jap.-Ch., N. Am. from Alaska to Labrador, Greenland. Described from Sweden. Type in London.

Note. The development of this plant consists of two phases. The first phase is represented by a short filiform saprophytic rootstock, on which wintering buds are formed. In spring these buds give rise to aerial shoots on which green leaves, flowers, and fruits are formed. In the case of failure to cross-pollinate, self-pollination occurs. This is effected by

* From the Greek words: monos= single, and esis= to send, thrust, because of the stipe bearing a solitary flower.

elongation and arching of the filaments accompanied by bending of the pedicel, so that the pollen from the anthers which open downward by means of pores is shed on the stigma of the same flower.

Genus 1086. **RAMISCHIA*** OPIZ

Opiz, Sezman (1852) 82.

Stamens straight, inserted on the nectariferous hypogynous disk; anthers not horned; pollen grains distinct; hypogynous disk 10-parted; capsule dehiscent from the bottom upward; flowers fairly small, in a 1-sided raceme.

An ancient ditypic genus, with circumpolar boreal distribution. Of the two species, *R. secunda* is more ancient and *R. obtusata* relatively recent.

1. Leaves oblong-ovate, acute; raceme dense, many-flowered 1. ***R. secunda*** (L.) Garcke.
16 + Leaves broadly ovate, obtuse or almost round-tipped; raceme rather loose, short, 4-10-flowered 2. ***R. obtusata*** (Turcz.) Freyn.

1. ***R. secunda*** (L.) Garcke, Fl. Deutschl. ed. IV (1858) 222.—
R. secunda var. *vulgaris* Kryl. Fl. Zap. Sib. IX (1937) 2093.—
R. secundiflora Opiz, Sezman (1852) 82.—*Pyrola secunda* L.
Sp. pl. (1753) 396; Ldb. Fl. Ross. II, 930; Boiss. Fl. or. III, 973;
Shmal'g. Fl. II, 188; Kuzn. in Mat. Fl. Kavk. IV, 1, 3; Kom. Fl.
Man'chzh. III, 191; Fl. Kamch. II, 351.—*P. secunda* var. *vulgaris*
Turcz. Fl. baic.-dah. II (1846) 213.—*Actinocyclus secundus*
Klotzsch in Monatsb. Acad. Berl. (1857). 14.— *Ic.: Fedch. and Fler. Fl.*
Evrop. Rossii, Fig. 593; Kom. and Alis. Opred. rast. Dal'nevost. kr. II,
Plate 25.— *Exs.: GRF, No. 374; Fl. cauc. exs. No. 290.*

Perennial; rootstock very long, giving rise to adventitious buds and aerial stems; leaves pale green, oblong-ovate, acute, finely crenulate-serrulate, rather rigid but not thick, few overwintering, borne on the lower part of the scape, but not crowded at base; scape 5-25 cm long; bracts borne on the upper part of the scape, 4-8 mm long, greenish or brownish, ovate-lanceolate, scalelike; leaf blades 1.5 cm long, 0.5-4 cm broad, sometimes up to 2-3 times as long or rarely about as long as the petiole; flowers spreading or the lower ones declined, in a dense many-flowered raceme; pedicel shorter than the flower and the broadly lanceolate floral bract; calyx-lobes broadly triangular, finally denticulate; corolla greenish-white, ovaloid to subcampanulate, 4-5 mm long, 3-5 mm broad, the petals 4-5 times the length of the calyx-lobes, lustrous, finely serrulate; anthers slightly exserted; style straight, 5-7 mm long, longer than the ovary and much exserted, borne on a 5-toothed disk, not ringed at the top; stigma broadly 5-lobed; capsule 4.5-6 mm broad, 3-4 mm long. June-July.

Mostly dark coniferous and pine woods.—European part: Kar.-Lap., Dv.-Pech., Balt., Lad.-Ilm., U.V., V.-Ka., U. Dnp., U. Dns., M. Dnp., U. Don, Transv., Bl., Urals, Crim.; Caucasus: Cisc., Dag., W. and E. Transc., Tal.; W. Siberia: all regions; E. Siberia: all regions; Far East: Ze.-Bur., Uss., Sakh., Uda, Okh., Kamch.; Soviet Central Asia:

* Named after F. A. Ramisch, a professor in Prague.

Dzu.-Tarb., T. Sh. (Centr.). **Gen. distr.:** Scand., Atl. and Centr. Eur., Med. (N.), Bal.-As. Min., Dzu.-Kash., Mong. (N.), Japan, E. China, N. Am. from Alaska to Labrador, southern limits California and N. Michigan; Greenland. Described from Sweden. Type in London.

2. **R. obtusata** (Turcz.) Freyn in Oesterr. Bot. Zeitschr. XIV (1895) 467.—**R. secunda** var. **obtusata** Turcz. Fl. baic.-dahur. II (1846) 213; Kryl. Fl. Zap. Sib. IX (1937) 2093.—**R. secunda** Garcke subsp. **obtusata** H. Andres in Fedde, Repert. XIX (1924) 219.—**Pyrola secunda** L. var. **pumila** Chamisso in Linnaea, I (1825) 514.—**P. secunda** L. var. **nummularia** Rupr. Fl. samoj. (1845) 47.—**P. obtusata** Turcz. ex Komar. in Tr. Bot. Sada, XXV (1905) 192.

Perennial; scape 3-15 cm long; leaves broadly ovate, obtuse or almost round-tipped, small, up to 2.3 cm long and 1-2 cm broad; inflorescence 4-10-flowered, 1.5-4 cm long; style sometimes 1.25-3 mm broad and 3 mm long (var. **brevistyla** N. Busch); in the latter case the plant does not differ from **R. secunda**.

Mostly in mountain woods, rare.—Arctic: Arc. Eur.; European part: Urals (N.); W. Siberia: Ob, Irt., Alt.; E. Siberia: Ang.-Say., Dau. Described from Dauria. Type in Leningrad.

Note. The variety **brevistyla** is possibly a hybrid between this species and **P. minor**(?).

Genus 1087. **CHIMAPHILA*** PURSH

Pursh, Fl. bor.-am. I (1814) 300.

Filaments strongly dilated in lower part, carinate on the back and thus trigonous; anthers with short horn opening by apical pores; pollen grains in tetrads; pistil virtually styleless, the subsessile stigma broad and orbicular; ovary enclosed by the hypogynous disk fashioned like a coriaceous ridge and not nectariferous; capsule erect, splitting from the top downward, the margins of valves naked; flowers in a terminate umbellate raceme.

An ancient ditypic circumpolar boreal genus.

1. Leaves oblong-obcuneate; flowers 2-8, sometimes up to 12. 1. **Ch. umbellata** (L.) Nutt.
- + Leaves lanceolate, acute; flowers solitary, rarely 2. 2. **Ch. japonica** Miq.

1. **Ch. umbellata** (L.) Nutt. Gen. North-Amer. pl. I (1817) 274; Ldb. Fl. Ross. II, 932; Maxim. Prim. fl. Amur. 191; Kom. Fl. Man'chzh. III, 197; Kryl. Fl. Zap. Sib. IX, 2090.—**Pyrola umbellata** L. sp. pl. (1753) 396; Shmal'g. Fl. II, 188.—**P. frutescens** Gilib. Fl. lithuan. V (1786) 195.—Ic.: Fedch. and Fler. Fl. Evrop. Rossii, Fig. 591; Fl. Yugo-Vost. VI, Fig. 546.

Perennial; rootstock creeping, buried, branched; aerial shoots branching in lower part, 8-20 cm long, ascending; scape and pedicels covered with minute glandular mammillae; leaves clustered on the lower part of the aerial stem, thick, coriaceous, evergreen, glabrous, dark green and lustrous above, pale beneath, oblong-obcuneate, acutely serrate,

* From the Greek words: *heimon* = winter, and *filein* = to love.

the blade 5-10 times the length of the very short petiole, 1.5-6 cm long, 0.5-1.5 cm broad, the leaves subverticillate; flowers 2-8, rarely up to 12, nodding, in a terminal umbellate raceme, the pedicels 0.6-2.5 cm long, up to 3.5 cm long in fruit; bracts linear to linear-subulate, irregularly toothed, 2-5 mm long, 0.5-0.7 mm broad, usually inserted on the upper fourth or at the middle rarely on the lower part of the pedicel; calyx-lobes rounded-ovate, obtuse, the margin fimbriate-dentate; corolla rose-colored, 8-12 (up to 15) mm in diameter, almost spreading, stellate; petals obovate, incurved, ciliolate-margined, 6-7.5 mm long, 4.5-5 mm broad; capsule flattened-globose, 3-5 mm long, 5-6.5 mm broad, both capsule and stipe puberulent. June-August.

Pine woods. — European part: Kar. -Lap., Lad. -Ilm., Dv. -Pech., U. Dnp., U. V., V. -Kam., U. Dns., U. Dnp., V. -Don, Transv., Urals; W. Siberia: Ob (south of 59.5°N), U. Tob., Irt., Alt.; E. Siberia: Yenisei, (very infrequent); Far East: Uda, Sakhalin. **Gen. distr.:** Scand., Centr. Eur., Japan, N. Am. Described from Sweden. Type in London.

2. **Ch. japonica** Miq. in Ann. Mus. Bot. Lugd.-Bat. II (1865-1866) 165; Maxim. in Mém. biol. VIII, 626; Kom. Fl. Man'chzh. III, 196. — **Ch. astyla** Maxim. in Mém. biol. VI (1867-1868) 207. — Ic.: Kom. and Alis. Opred. rast. Dal'nevost. kr. II, 254.

Perennial; the underground part of the stem gives rise to slender creeping shoots bearing scaly basal leaves, the upper part of the stem erect or ascending, simple or branched, (5) 10-15 cm long; leaves opposite or approximate in 2's or 3's-4's, short-petiolate, lanceolate, acute, finely serrulate, occasionally interspersed with small alternate sessile scalelike brownish leaves; scapes solitary or several, roughly pubescent, terminal and axillary, bearing 1-2 light-colored scalelike bracts and a solitary flower (rarely 2); flowers nodding, the corolla spreading, 13-18 mm across; calyx-lobes oval-oblong to broadly oval, fimbriate-margined in fruit; petals incurved, rounded-oboate, 6-9 mm long, 3.5-4 mm broad; stamens 10, shorter than the petals; stigma sessile; capsule erect, globose, 4-5 mm long, 6-7 mm broad. June-August.

Mossy, chiefly coniferous, woods. — Far East: Uss. **Gen. distr.:** Japan, Korea. Described from Japan. Type in Leiden.

19 Note. The species *Ch. maculata* (L.) Pursh. occurs in the Atlantic Coast states of North America.

Family CXXII. **MONOTROPACEAE** (NUTT.) LINDL. *

Calyx spurious, formed of bractlike scales; corolla of 4-5 (6) distinct petals, persistent or rarely deciduous; stamens twice as many as petals, the tips of filaments incurved at maturity and thus the distal end of anthers pointing inward, i.e., toward the flower base; filaments inserted between the lobes of the hypogynous disk, the latter paired, opposite the saccate petal bases; pistil with a short style and funnel-shaped enlarged stigma; ovary superior, 4-5-septate in lower part; placentation central; ovules numerous, very minute; fruit a 4-5-valved capsule, septate in lower part; seeds numerous, very minute, enclosed in a transparent sacculate membrane; whitish herbaceous perennials, devoid of chlorophyll, turning

* Prepared by E. G. Bobrov.

black on drying, lacking true leaves, the simple stem bearing alternate scales; saprophytes.

In addition to our two monotypic genera, distributed over both the western and eastern hemispheres, the genus includes two other genera from SE Asia and 6 genera from the Pacific Coast of North America; of the latter, only one is known to contain three species, while the others are monotypic. All the members of the family are saprophytic.

Key to Genera

1. Flowers solitary at the end of the stem 1088. **Monotropia** Nutt.
+ Flowers in a dense terminal 3-8-flowered raceme
. 1089. **Hypopitys** Adans.

Genus 1088. **MONOTROPA** * NUTT.

Nutt. Gen. Amer. I (1818) 271; G. Don, Gen. Syst. III (1834) 866; Endl. Gen. (1836-1840) 761; Benth. et Hook. Gen. pl. II (1876) 607.

- 20 Flowers solitary at the end of the stem; calyx lacking and replaced by bractlike scale; petals 5-6, distinct, obovate-oblong, very slightly saccate at base, tardily deciduous; stamens 10-12; disk 10-12-rayed; ovary 5-loculed; style short, columnar; stigma funnel-shaped, obscurely crenulate-margined; capsule 5-valved, 5-celled in lower part; seeds numerous and minute, with a loose coat. Colorless nonchlorophyllous herbaceous perennials with simple scale-bearing stems and solitary nodding flowers.

A monotypic genus.

1. **N. uniflora** L. Sp. pl. (1753) 387; DC. Prodr. VII, 2, 781; Hook. Fl. of Brit. Ind. III, 476; Kom. Fl. Man'chzh. III, 199; Domin in Sitzungsber. Böhm. Ges. d. Wissensch. (1915) 3.— Ic.: Kom. and Alis. Opred. rast. Dal'nevost. kr. II, Plate 255; Sugawara, Ill. Fl. of Saghal. III, 665.

Perennial; rhizome densely short-branched, forming a matted ball; aerial stem 10-20 cm long; cauline scales numerous lanceolate to oval-lanceolate, alternate, white; flower solitary, terminal, oblong-campanulate, nodding; the summit of the stem straightening out somewhat in fruit; corolla hairy within, white, longer than the stamens, consisting of 5-6 petals; stamens 10-12, the filaments hairy, the anthers orange-yellow; ovary ovoid, the stigma large; capsule suberect, globose, ca. 2-2.5 cm in diameter; style ca. 2 mm long; stigma funnel-shaped, ca. 6-8 mm across. Fl. June-July; fr. August-September.

Mossy dark coniferous forests.— Far East: Uss. (S.), Sakh. (S.).

Gen. distr.: Himalayas, China, Korea, Japan, America (from Newfoundland and Canada in the north to Guatemala and Colombia in the south). Described from North America. Type in London.

* From the Greek words: monos = one, single, and tropos = form, way of life, as these are sometimes the only flowering plants in the dense forest shade.

Genus 1089. **HYPOPITYS*** ADANS.

Adans. Fam. II (1763) 443; Nutt. Gen. Amer. I (1818) 270; G. Don, Gen. Syst. III (1834) 866; DC. Prodr. VII, 2 (1839) 780; Endl. Gen. (1836-1840) 761; Benth. et Hook. f. Gen. Plant. II (1876) 607.—*Monotropa* L. Sp. pl. (1753) 387, p.p.

- Flowers in a drooping terminal raceme; calyx spurious, formed by spirally arranged bractlike scales; petals 4-5, longer than the nearest bracts, saccate at base, acuminate, straight; stamens 8-10; disk 8-10-rayed at base; ovary 4-5-loculed; style terminal, straight, columnar, enlarged at the top into a funnel-shaped stigma, which is rough or hairy at the edges with 4-5 crenulations; capsule 4-5-celled, the numerous minute seeds covered with a very thin coat. Colorless perennial herbs, devoid of chlorophyll, the simple fleshy stems covered with alternate leaf scales. A monotypic genus.

1. **H. monotropa** Crantz. Instit. II (1766) 467.—*Monotropa hypopitys* L. Sp. pl. (1753) 387; M.B. Fl. taur.-cauc. III, 289; Turcz. Fl. baic.-dahur. II, 216; Boiss. Fl. or. III, 975; Kom. Fl. Man'chzh. II, 198; Kuzn. in Mat. Fl. Kavk. IV, 1, 9; Grossg. Fl. Kavk. III, 199; Kryl. Fl. Zap. Sib. IX, 2102.—*M. flagrans* Gilib. Fl. lithuan. II (1781) 191.—*H. multiflora* Scop. Fl. Carn. ed. 2, I (1772) 285; Ldb. Fl. Ross. II, 934; Shmal'g. Fl. II, 189.—*M. hypopitys* var. *hirsuta* Roth, Tent. Fl. Germ. II, 1 (1789) 462; Fedch. and Fler. Fl. Evrop. Rossii, 720.—*H. multiflora* var. *hirsuta* Ldb. l.c.—*M. hirsuta* Hornem. Dansk. oeconom. Plant. ed. 3, II (1837) 179.—*M. multiflora* (Scop.) Fritsch, Excursionsfl. Oesterr. (1897) 26; Szaf. Kulcz. Pawl. Rosl. polskie, 460.—*M. hypophegea* Wallr. Schedulae Crit. I (1822) 1911; Szaf. Kulcz. Pawl. l.c.; Kom. and Alis. Opred. rast. Dal'nevost. kr. II, 834.—*M. hypopitys* var. *glabra* Roth, l.c.; Fedch. and Fler. l.c.—*M. glabra* Bernh. ex Rchb. Fl. Germ. exc. (1830-1832) 411.—*H. glabra* DC. Prodr. VII, 2 (1839) 780.—*H. multiflora* var. *glabra* Ldb. l.c.—Ic.: Fedch. and Fler. Fl. Evrop. Rossii, Fig. 596.—Exs.: GRF, No. 677.

Perennial; rhizomes forming a densely branched matted ball; plant glabrous (var. *glabra* Roth) or pedicels, petals, stamens, and style hirsute and floral scales ciliate (var. *hirsuta* Roth), whitish when fresh, turning black on drying; stem fleshy, erect, simple, 10-25 cm long; leaf-scales fleshy, alternate, ovate-oblong, sessile, 5-15 mm long, 3-9 mm broad; flowers 3-8, in a dense drooping terminal raceme, becoming erect in fruit; floral scales gathered below the flower in the form of a calyx, true calyx lacking; corolla tubular-campanulate, the terminal flower 5-merous, the lateral ones 4-merous; petals oblong-obovate, slightly enlarged at apex, 11-14 mm long, 2.5-4 mm broad, obtuse, irregularly dentate, slightly saccate at base; stamens 8-10, somewhat shorter than the corolla; capsule obovoid; ca. 1 cm long; style topped by a funnel-shaped stigma, ca. 5 mm long. Fl. July; fr. August.

- Pines, shady coniferous, broadleaf, and mixed woods.—European part: Kar.-Lap. (S.), Lad.-Ilm., U. Dnp., U. V., Dv.-Pech. (S.), V.-Ka., U. Dns., M. Dnp., V.-Don, Transv., Crim.; Caucasus: Cisc., Dag., W. and E. Transc.; W. Siberia: Ob (S.), U. Tob., Irt., Alt. (W.); E. Siberia: Ang.-Say., Lena-Kol. (S.), Dau.; Far East: Ze.-Bur., Uss., Uda, Sakh.; Soviet Central Asia: Dzu.-Tarb. (Dzharkent area (Paniflov)).

* From Greek: hypo = below, and pitys = spruce, referring to habitat.

Gen. distr.: Scand. (S.), Atl.; Centr., S. Europe (from Spain to Greece), Himalayas, Manchuria, Korea, Japan, N. Am. (from Canada to Mexico). Described from W. Europe. Type in London.

Note. West European authors have repeatedly tried to separate hairy and glabrous forms of *Hypopitys* as distinct species. In this connection there was an attempt to associate the glabrous form with beech woods (hence the name *M. hypophegea*) and the hairy form with dark coniferous woods (*M. hypopitys* var. *hirsuta*). It is certain, however, that there is not strict association of any one form with a particular forest type and one is bound to agree with the view of F. Kamenskii "Contributions to the Morphology and Biology of *Monotropa hypopitys* and Some Other Saprophytes" (Materialy dlya morfologii i biologii *Monotr. hypopitys* i nekotorykh drugikh saprofitov) Odessa, 1883 that the varieties are connected by a number of transitional forms. It may be assumed that these varieties are expressions of physiological differences between the plants, due to different substrates on which these plants develop, i.e., the various kinds of litter which characterize dark coniferous, broadleaf, and other woods. In this study Kamenskii also proved beyond doubt that the genus leads a saprophytic mode of life; the discussions of this question engaged in until recently concerning proof of the parasitic nature of this plant are without substance.

Family CXXIII. **ERICACEAE** DC.*

Flowers regular or irregular; calyx 4-5-parted or -toothed; corolla of 3-5 distinct fused petals; stamens twice as many or rarely as many as corolla lobes, the filaments distinct, rarely connate at base or adnate to corolla, both series of stamens equally developed; anthers introrse, basifixed, mostly opening by a pore on the upturned, morphologically lower end or a longitudinal chink, often with 2 hornlike appendages, the horns borne on the morphological apex, at the middle, or near the base of the anther, or lacking; pollen grains united in tetrads; ovary (2) 4-5-celled, rarely 3-celled, corolla and stamens inserted at the margin of a hypogynous disk which is nectariferous between the stamens; placentation central, each cell containing one or usually numerous, ovules; style inserted in a depression on the top of the ovary, columnar, rarely conical; stigma simple or lobed; fruit a few-seeded drupe or a many-seeded capsule; embryo central, cylindric; endosperm profuse; subshrubs, shrubs, or rarely small trees; leaves alternate, opposite, or verticillate, deciduous or evergreen, with an expanded blade, acicular, or scalelike; flowers

* Originally prepared by E. A. Bush; the manuscript required extensive revisions, which were done by A. I. Poyarkova.

A. I. Poyarkova compiled the key to genera; she is responsible for the treatment of the genera *Botryostegia*, *Menziesia*, *Eubotryoides*, *Erica*, *Bruckenthalia*, and the subgenera *Rhodorastrum* and *Tsutsutsi* of the genus *Rhododendron*. She also proposed the subgeneric classification of the genus *Rhododendron*, compiled the key to its species, introduced certain modifications in nomenclature, revised the extent of some species, supplemented the synonymy, and checked reports concerning the distribution of species of this genus.

A. I. Poyarkova revised the manuscript dealing with the genus *Arctous*, while adding two species new to our flora.

solitary in the axils, or gathered in terminal or axillary, umbellate, racemose, or paniculate inflorescences.

About 80 genera with more than a thousand species, distributed in both hemispheres from arctic deserts to tropical regions. The family is represented in the USSR by 21 genera. In addition, one genus, *Kalmia* L., was erroneously reported for the Komandorski Is. (*K. polifolia* Wagh.—under the synonymous name *K. glauca* Ait.).

Fossilized representatives of the family have been identified by pollen analysis for the Cretaceous period (S. Urals).

In addition to the species belonging to genera described here, there is fossil evidence for *Leucothoe protogaea* Schimp. in Tertiary layers of W. Transcaucasia (Goderzi Pass), in lower Oligocene of S. Transcaucasia (Darry-Dag), and from the Miocene of S. Transcaucasia (Zanga R.).

Key to Genera

1. Corolla of 3 distinct oblong petals, 10-13 mm long; ovary and capsule trigonous, 3-celled; flowers in long bilateral racemes; bracts foliaceous 1090. **Botryostegia** Stapf.
- + Corolla of 5 free much smaller petals, or gamopetalous 4-5-parted or -lobed; ovary and fruit 4-5-celled 2.
2. Corolla coriaceous, persistent in fruit 3.
- + Corolla succulent, promptly deciduous 5.
3. Calyx much longer than the corolla, both rose-violet or rarely white; leaves 1.5-2.5 mm long, scalelike, trigonous, sagittate at base, sessile, imbricated in 4 series 1108. **Calluna** Salisb.
- + Calyx much shorter than the corolla, green or more or less rose-tinted; leaves 3-4 (8) mm long, narrowly linear, flat, attenuate into a short petiole, in whorls of 3-4 (5). 4.
- 24 4. Corolla and calyx rose-colored; filaments of stamens connate at base; anthers obtuse, unappendaged. 1110. **Bruckenthalia** Rchb.
- + Corolla white or flesh red; calyx green; filaments of stamens not connate; anthers acute, appendaged 1109. **Erica** L.
5. Leaves small, scalelike, ovate-triangular, in decussate pairs, imbricated and tightly appressed 1097. **Cassiope** D. Don.
- + Leaves differing in shape, divergent 6.
6. Leaves small, 2.5-14 mm long, 0.7-2 mm broad, narrowly linear or apparently so due to revolute margins, in 4 ranks or alternate. 7.
- + Leaves broader and much larger, alternate, and if small then elliptic or narrowly elliptic, opposite or in whorls of 3 9.
7. Corolla rotate; flowers borne in terminal racemes on long flowering shoots as opposed to sparsely leafy sterile shoots; anthers unappendaged. 1096. **Bryanthus** Stell.
- + Corolla campanulate or urceolate, lobed; flowers solitary or in umbellate racemes at the ends of leafy shoots, these not differing from the sterile shoots 8.
8. Flowers campanulate, solitary; anthers fixed by the apex at the base of aristate appendages; style stout, conical; leaves 4-ranked 1098. **Harrimanella** Cov.
- + Flowers urceolate, in umbellate racemes of 2-15; anthers unappendaged, fixed about the middle; style slender, columnar; leaves alternate 1095. **Phyllodoce** Salisb.

9. Leaves small, 3-8 mm long, elliptic or narrowly elliptic, opposite or in whorls of 3 10.
- + Leaves larger, alternate 11.
10. Leaves opposite, oblong-elliptic; anthers unappendaged, opening by a slit extending along the entire anther. . . . 1094. *Loiseleuria* Desv.
- + Leaves in whorls of 3, elliptic; anthers with 2 aristate appendages in lower part, opening by a terminal chink.1099. *Arctericia* Cov.
11. Leaves evergreen, firmly coriaceous 15.
- + Leaves deciduous, herbaceous 12.
12. Corolla actinomorphic, 4-7 mm long, urceolate, the limb narrow, the tube several times as long as the lobes 13.
- 25 + Corolla zygomorphic, usually much larger, rarely (in *Rh. Tschonoskii*) ca. 8 mm long, enlarged toward apex, rotate campanulate or infundibuliform, the lobes of the broad limb normally much longer rarely somewhat shorter than the tube 1092. *Rhododendron* L.
13. Fruit a juicy drupe; depressed prostrate shrubs; leaves deciduous, obovate or oblanceolate from a long narrowly cuneate base, prominently reticulate, serrulate-margined 1107. *Arctous* (A. Gray) Niedenzu.
- + Fruit a capsule; small erect shrubs with elliptic entire ciliate leaves. 14.
14. Flowers in long panicles at the ends of axillary leafy shoots 1100. *Eubotryoides* (Nakai) Hara.
- + Flowers in umbellate leaflets; panicles developing from terminal buds. 1093. *Menziesia* J.E. Smith.
15. Corolla divided down to base, white; flowers in umbellate and corymbose inflorescences 1091. *Ledum* L.
- Corolla gamopetalous 16.
16. Pollen sacs without appendages or awns 17.
- Pollen sacs appendaged or awned 19.
17. Calyx accrescent and becoming fleshy, enclosing the capsule; flowers small, in long many-flowered panicles borne (1) 2-4 at the ends of shoots 1104. *Gaultheria* L.
- + Calyx not accrescent and not becoming fleshy; differing in other characters 18.
18. Calyx-lobes large, foliaceous, carmine-red; corolla regular; anthers opening by longitudinal slits 1103. *Epigaea* L.
- + Calyx with small green teeth; corolla zygomorphic; anthers opening by apical pores 1092. *Rhododendron* L.
19. A large-leaved tree; flowers in terminal panicles; corolla globose-urceolate; fruit a berrylike many-seeded drupe, granular outside. 1105. *Arbutus* L.
- + Low small-leaved shrubs; differing in other characters 20.
20. Fruit a smooth, mealy red, drupe; anthers with subulate apical appendages, opening by an oval pore; flowers in short drooping few-flowered terminal clusters 1106. *Arctostaphyles* Adans.
- 26 + Fruit a capsule; anther-sacs prolonged into an elongated subulate horn. 21.
21. Anther-sacs prolonged into a straight horn opening in a terminal pore; flowers in 1-sided racemes at the ends of branches; leaves scurfy beneath with whitish scales, the wintering ones with brownish scales 1102. *Chamaedaphne* Moench.

- + Anther-sacs prolonged into a curved horn opening at base; flowers in terminal umbels; leaves smooth beneath and glaucous-white with thick waxy bloom 1101. *Andromeda* L.

Subfamily I. **RHODODENDROIDEAE** Drude in Engl. — Pr. Pflanzenf. IV, 1 (1891) 31. — Fruit a septicidal capsule; seeds with loose testa, often winged; corolla polypetalous or gamopetalous, deciduous; anthers unappendaged.

Genus 1090. **BOTRYOSTEGE*** STAPF.**

Stapf in Kew Bull. (1934) 194.

Calyx of 5 large distinct sepals, persistent; petals 3, distinct, overlapping in the bud only at the margin; stamens 6, with broad flat filaments; anthers dorsifixed near the base, their thecae opening by a broad terminal pore narrowing downward into a narrow slit; ovary borne on a very short gynophore, 3-lobed, 3-celled, the cells many-ovuled; capsule short-stipitate, cartilaginous, 3-lobed, septicidal; seeds small, oblong, flattish; seed coat short-winged at apex; a low shrub with alternate leaves, the flowers in long terminal clusters subtended by leaflike bracts.

A monotypic genus.

1. **B. bracteata**. (Maxim.) Stapf in Kew Bull. (1934) 194. — *Tripetaleia bracteata* Maxim. in Bull. Acad. Sc. Petersb. XI (1867) 433; in Mém. biol. VI, 206; Boiss. in Bull. Herb. Boiss. V, 915; C.K. Schn. Laubholz. II, 467; Matsum. Ind. pl. jap. II, 2, 466; Vorob'ev in Tr. Dal'nevost. bazy AN SSSR, Gen. ser. I, 27. — *Elliotia bracteata* Hook. f. in Benth. et Hook. Gen. pl. II (1876) 598. — Ic.: C.K. Schn. l.c. f. 311, g-i, 312, b; Komatsu in Matsum. lc. pl. Koisikav. I, tab. 71; Stapf, l.c. tab. ad. pag. 192.

- 27 A much-branched shrub, up to 2 m tall; buds with 2-3 imbricated coriaceous outer scales; shoots slender, reddish-brown, minutely puberulent, becoming gray with age; leaves glabrous, oblong-obovate, 1.5-6 cm long, 0.7-2.3 cm broad, narrowly cuneate at base, short-petioled, obtuse to subacute, terminating in a short, indurated, obtuse point; panicles at the end of young leafy shoots, 5-15 cm long; bracts foliaceous, the lower ones 11-15 mm long, 4-7 mm broad, elliptic to oblong-obovate; pedicels 3-15 mm long, with 2 lanceolate bracteoles 5-10 mm long and 0.5-0.8 mm broad; sepals elliptic-oblong, 5-7 mm long, 1.7-2 mm broad, covered with short hairs on the outside and the margin; corolla rose-colored; petals linear-oblong, rarely oblong-obovate, 10-13 mm long, 2-4 mm broad, about $2\frac{1}{2}$ times the length of the stamens; style long, curved in upper part, cylindric, with a 3-lobed stigma; capsule globose, somewhat flattened, 3 mm long, 3.5-4 mm in diameter, Fl. July-August; fr. September (Plate III, Figure 1).

Mountains; in the upper forest zone, in scrub thickets and cedar woods.—Far East: Sakh. (Kurile Is.). **Gen. distr.**: Japan (Hokkaido and N. part

* From Greek: botrys = cluster, and stegē = roof.

** Prepared by A. I. Poyarkova.

of Honshu Is.). Described from Hokkaido Is. Type (lectotype) in Leningrad.

Note. The genus *Botryostegia* is more closely related to the genus *Cladothamnus* Bong. (of which the only species, *C. pyroliflorus* Bong. is distributed in western North America, from Alaska to Colorado and Oregon) than to the genus *Tripetaleia* S. et Z. (with a single species in Japan — *T. paniculata* S. et Z.) with which it has been erroneously connected.

Economic importance. Ornamental.

Genus 1091. **LEDUM** L.

L. Sp. pl. (1753) 391

Calyx 5-toothed; corolla of 5 distinct obovate petals; stamens 10, the obtuse anthers opening by 2 apical pores; capsule septicidal, splitting into valves from the base upward.

Of the 8 species of this boreal circumpolar genus, three occur in the USSR.

- | | | | | |
|----|--|--|-----------------------------------|-----------------------|
| 1. | Leaves white-tomentulose beneath | 2. | <i>L. hypoleucum</i> Kom. | |
| + | Leaves rusty-tomentulose beneath | 2. | | |
| 2. | Leaves linear, 8-14 mm long, 1-1.5 mm broad, the margins strongly revolute | 3. | <i>L. decumbens</i> (Ait.) Small. | |
| 28 | + | Leaves linear-oblong to oblong-oval, 7-50 mm long, 1-12 mm broad, the margin slightly revolute | 1. | <i>L. palustre</i> L. |

1. *L. palustre* L. Sp. pl. (1753) 391; Ldb. Fl. Ross. II, 2, 923; Shmal'g. Fl. II, 186; Kom. Fl. Man'chzh. III, 129; E. Bush in Fl. Sib. i Dal'n. Vost. II, 3; Kuzn. in Fl. Az. Ross. 9, 7; Kom. Fl. Kamch. II, 356; Hulten, Fl. Kamtch. IV, 11; Kryl. Fl. Zap. Sib. IX, 2105. — Ic.: Rchb. lc. Fl. Germ. XVI, tab. 1160, f. 1-2; Vol'f and Palib. Der. i kust. 283; C.K. Schn. Laubholz., f. 133, 1-g; E. Bush, l.c. 7; Hegi, Fl. V, 3, f. 2640-2642. — Exs.: GRF, No. 272.

Shrubs, 12-125 cm tall, evergreen, very aromatic, with dark-gray bark; young branches covered with ferruginous tomentum, leaves alternate, linear-oblong or narrowly linear (var. *angustum* E. Busch: leaves 1-1.5 mm broad, with a strongly revolute margin) or oblong-elliptic (var. *dilatatum* Wahlbg.: leaves 5-12 mm broad, with a slightly revolute margin), 7-50 mm long, 1-12 mm broad, coriaceous, short-petioled (the petioles 1-3 mm long), more or less revolute at the margin, the upper surface dark-green, lustrous and beset with small yellowish glands, the underside covered with rusty-brown tomentum; flowers numerous, gathered in a corymbose inflorescence at the ends of branches; pedicels slender, 10-27 mm long, densely covered with rusty-brown tomentum and glands, declined in fruit, the subtending bracteoles scalelike, deciduous; calyx free, minute, the sepals persistent, round-tipped; petals free, white, deciduous, 4-8 mm long, 2.5-4 mm broad; filaments of stamens ciliate at base; stigma slightly 5-lobed; capsule ovaloid, glandular, 5-locular, 3-8 mm long, the style persistent; seeds small, narrow, the loose coat with membranous wings at the ends. Fl. May-July; mature fr. July-August.

Peat bogs, damp coniferous woods, permafrost and water courses. — Arctic: An., Chuk.; European part: Kar. -Lap., Dv. -Pech., Lad. -Ilm.,

U.V., V.-Ka., U. Dnp., M. Dnp., V.-Don; W. Siberia: all regions; E. Siberia: all regions; Far East: Ze.-Bur., Uda, Okh., Sakh., Uss., Kamch. **Gen. distr.:** Scand., Centr. Eur., Bal., Jap.-Ch., N. Am. Described from Sweden. Type in London.

- Note. Three varieties of *L. palustre* L. can be distinguished: var. *dilatatum* Wahlbg., distributed in the USSR in Kar.-Lap, Lad.-Ilm, Dv.-Pech., Ob, Alt., and outside the USSR in Sweden, established in relatively wet habitats; var. *angustum* E. Busch with narrower and strongly revolute-margined leaves, associated with physiologically dry habitats; and var. *glabratum* Kryl., which apparently includes small specimens of var. *dilatatum*, with faint vestiture or quite glabrous. The rusty tomentum in var. *dilatatum* disappears with age; so that the leaves become nearly glabrous and the reticulate venation stands out.

Economic importance. In the past, the leaves were used medicinally under the name *folia Ledi palustris* for the treatment of a wide range of ailments. They were also employed in pulverized form as an insect repellent. The leaves contain a bitter toxic glycoside andromedotoxin ($C_{31}H_{50}O_{10}$), the glycosides abrutin and ericolin which decompose into sugar, the oily substance ericinol, and a tanninlike substance (ledic acid) which, upon boiling with concentrated mineral acids produces a yellowish-red substance, ledixanthin. An essential oil, occurring in greatest quantity prior to flowering, has an overpowering scent and burning taste; it contains a ketone ($C_{15}H_{24}O_9$) and ledol ($C_{15}H_{26}O$), and is highly toxic, affecting the nervous system. In addition, N. P. Kir'yalov discovered in the oil the alcohol pallustrol and the hydrocarbon myricin. An extract of the underground parts of the plant and the oil stimulate the action of the stomach muscles and the mucous membranes of the intestines; they act as an emetic and produce palpitation, perspiration, and asphyxia. Owing to the bitter taste, the leaves are sometimes used in brewing as a hop substitute.

2. *L. hypoleucum* Kom. in Izv. Bot. Sada, XVI (1916) 175. — *L. palustre* Rupr. Fl. Petrop. (1845) 57; Nachr. Amur. II (1857) 553; Maak, Amur. (1859) 82. — Ic.: E. Bush in Fl. Sib. i Dal'n. Vost. II (1915) 6.

A shrub, 50-110 cm tall, with erect branches; young branches covered with ferruginous tomentum which gradually disappears with age; leaves oblong-oval in outline, 1.7-8 cm long, 0.5-2 cm broad, revolute-margined, coriaceous, short-petioled, the upper surface dark-green, lustrous, the underside white-tomentulose with small shiny glands; flowers numerous, gathered in a corymbose inflorescence at the end of branches; pedicels slender, 13-30 mm long, divergent in fruit, the subtending bracteoles scalelike, deciduous; calyx minute, the sepals round-tipped caducous; petals white, deciduous, 5-7 mm long, 2-3 mm broad; stigma slightly 5-lobed; capsule ovaloid, glandular, 5-locular, 4.5-8 mm long, the style persistent; seeds small, narrow, winged at both ends. Fl. June-July; fr. August-September.

Mossy swamps, peat bogs, spruce and broadleaf woods, and river banks. — Far East: Okh., Sakh., Uda, Uss. **Gen. distr.:** Japan, N. Am. Described from the Far East. Type in Leningrad.

- 30 Note. This Far Eastern species is associated with the sea coast. In the USSR it occurs on the coast of the Tatar Strait. The herbarium of the Botanical Institute of the Academy of Sciences of the USSR contains a Japanese specimen from Isotoitsuji, from Mt. Osore yama collected on

16 August 1907. It closely resembles *Ledum columbianum* Piper from the western part of North America. While it is true that the description of the latter species refers to 5-7 stamens, the specimen in the herbarium of the Botanical Institute (topotype) has 8 stamens. Most likely the author studied a specimen which had already lost some of the stamens. If the material available in the herbarium of the Botanical Institute were not confined to a single herbarium sheet, it might have been possible to combine these two species into one, while retaining the priority for *L. columbianum* as described in 1904.

The distribution areas of two species — *L. hypoleucum* Kom. and *L. palustre* L. var. *dilatatum* Wahlenb. — overlap in the Far East, and hybridization between them apparently occurs. The white pubescence of the intermediate forms is overlain with tufts of rusty-brown hairs in varying amounts. Transitions occur from *L. palustre* var. *dilatatum* to *L. hypoleucum* Kom. In the true *L. palustre* var. *dilatatum* there is no white tomentum beneath the rusty pubescence, and it occurs only where the distribution areas of the two species meet.

3. *L. decumbens* (Ait.) Small in N. Amer. Fl. 29, 1 (1914) 37; Lodd in Steud. Nomencl. ed. 2, II (1841) 20, nom. nud. — *L. palustre* var. *decumbens* Ait. Hort. Kew. II (1789) 65; Ldb. Fl. Ross. II, 932; Kom. Fl. Man'chzh. III, 1, 201; E. Bush in Fl. Sib. i Dal'n. Vost. II, 8; I. Kuzh. in Fl. Az. Ross. 9, 8; Kom. Fl. Kamch. II, 357; Hulten, Fl. Kamtsch. IV, 8; Kryl. Fl. Zap. Sib. IX, 2106. — Ic.: C.K. Schn. Laubholzsk. (1912) 468, f. 312i; E. Bush, l. c. 9.

A low decumbent shrub; leaves alternate, linear, strongly revolute at the margin, 8-14 mm long, 1-1.5 mm broad, dark green and lustrous above rusty brown-tomentose beneath; flowers numerous, gathered in a corymbose inflorescence at the ends of branches; pedicels 5-15 mm long, densely puberulous and glandular, declined in fruit, the scalelike subtending bracteoles deciduous; calyx free, minute; petals white, deciduous, 4-5 mm long, 2-2.5 mm broad; stamens 10; stigma slightly 5-lobed; capsule ovaloid, glandular, 5-locular, 3-4 mm long. May-July.

Balds, sprawling-cedar woods, sandhills, dry spruce forests. — Arctic: Arc. Eur., Arc. Sib., Chuk., An.; European part: Kar.-Lap., Lad.-Ilm., Dv.-Pech.; E. Siberia: Lena-Kol.; Far East: Okh., Kamch., Sakh.

Gen. distr.: Scand., Greenland, Ber., N. Am. (Sitka, Kodiak Is., Labrador). Described from Hudson Bay in the NE part of N. America. Type in London.

Calyx 5-parted or 5-lobed, very small, sometimes hardly discernible; corolla rotate, campanulate, or funnelform, with a broad or narrow tube and slightly irregular 5- or rarely 6-10-lobed limb; stamens 5-10, exserted or included in the tube; anthers opening by a round terminal pore; ovary 5-10-celled; fruit a 5-locular 5-valved septicidal capsule; seeds minute, numerous; shrubs, rarely trees, with evergreen or deciduous alternate

* From Greek: rhodon = rose, and dendron = tree.

usually entire or occasionally serrulate leaves; flowers in umbellate clusters developing from terminal or lateral buds, rarely solitary.

More than 400 species distributed through the temperate regions of the northern hemisphere, especially in the mountains of SE Asia and the Himalayas; a number of species occurring in the Arctic, the mountains of the Malay Archipelago, New Guinea, and N. Australia.

Economic importance. All *Rhododendron* species are ornamental plants. The wood of arboraceous species (for instance *Rh. ponticum*) provides excellent material for joinery and turnery.

Rhododendron kamschaticum Pall. in Pliocene layers of Kamch. (Malaya, Chazhma T.) — *Rh. ponticum* L. in the upper Pliocene (Chauda) layers of W. Transcaucasia (Guria).

1. Young shoots, petioles, calyx, and ovary densely covered with flat rusty setiform hairs 15. **Rh. Tschonoskii** Maxim.
- + Hairs different. 2.
2. Underside of leaves and mostly also the upper side as well as other parts of the plant bear round aromatic scalelike sessile glands. . . 12.
- + Scalelike sessile glands lacking 3.
3. Peduncles bearing 1-3 flowers, with several large leaflike spirally arranged bracts; corolla rotate, purple; leaves deciduous, up to 6 cm long and 2 cm broad, reticulate, densely long-ciliate on the margin (subgenus *Therorhodium*) 4.
- + Peduncles without leaflike bracts, always bearing solitary flowers; differing in other characters 5.
4. All filaments about the same length; corolla ca. 1.5 cm in diameter; style half as long as the stamens; leaves not exceeding 1.8 cm, elliptic-obovate or ovate 19. **Rh. Redowskianum** Maxim.
- + 5-stamens much longer than the remaining 5; corolla 2.5-5 cm in diameter; style longer than the stamens; leaves 1.5-6 cm long, obovate. 18. **Rh. kamschaticum** Pall.
5. Leaves deciduous, thin, the entire margin or merely its proximal part ciliate 6.
- + Leaves perennial, firm, coriaceous, not ciliate-margined; an ever-green plant (subgenus *Leiorhodium*). 7.
6. Leaves broad, cuneate-obovate, in tufts of 4-5 at the ends of shoots; flowers solitary or in 2's or 3's; corolla pale rose-colored, rotate-funnelform, the limb several times the length of the short tube. 16. **Rh. Schlippenbachii** Maxim.
- + Leaves oblong-elliptic to oblong-obovate; shoots uniformly leafy; flowers in an umbellate cluster; corolla yellow, funnelform, the cylindric tube longer than the limb 17. **Rh. luteum** Sweet.
7. Leaves glabrous beneath 8.
- + Leaves tomentose beneath 10.
8. Corolla rose-violet, the calyx-teeth equal in length to the ovary; ovary finely glandular-pubescent; a tall shrub or tree, up to 3-6 (8) m tall. 1. **Rh. ponticum** L.
- + Corolla yellow; calyx-teeth obsolescent; ovary tomentose with simple rusty hairs; low or rather low shrubs 9.
9. Leaves 2.5-8 cm long, revolute at the margin; shoots bearing bud scales persisting 2-4 years 5. **Rh. aureum** Georgi.
- + Leaves (6) 9-15.5 cm long, flat or slightly revolute; bud scales usually caducous, sometimes a few persisting 1-2 years. 4. **Rh. hypopitys** Pojark.

10. Sheets beset at the nodes with persistent bud scales; leaves covered beneath with a fine tightly appressed brown tomentum, prominently reticulate above 6. *Rh. caucasicum* Pall.
 + Shoots smooth, without bud scales; leaves thickly covered beneath with loose or flocculate white or brownish tomentum; veins not prominent. 11.
11. Leaves oblong-elliptic, subobtusate, 8-15 cm long; calyx-teeth 0.5 mm long and 2-2.5 mm broad; corolla purple 3. *Rh. Smirnovii* Trautv.
 + Leaves obovate, 12-22 cm long, abruptly attenuate to a mucro 1-3 mm long; calyx-teeth 3-10 mm long, linear-lanceolate; corolla white. 2. *Rh. Ungernii* Trautv.
12. Leaves revolute at the margin; flower buds terminal, producing 2 3-5-flowered umbellate inflorescences; bud scales few, in 2-3 series, early caducous; corolla tubular with patellate or broadly funnelliform limb and distinct tube (subgenus *Osmothamnus*) 16.
 + Leaves not revolute; flower buds producing a single flower, with numerous multiseriate scales, lateral, solitary or in cluster of 2-6 (8) in axils of the approximate upper leaves; corolla broadly campanulate, with a very short tube (subgenus *Rhodorastrum*) 13.
13. Leaves dark olivaceous-green above, rusty-brown beneath, wintering; flowering in spring while densely clothed in preceding year's leaves. 15.
 + Leaves bright green above, light colored beneath, turning brown in fall and nearly all falling except for few wintering ones; flowering in spring in leafless condition 14.
14. Corolla 1.4-2.2 mm long, the broad limb 2.2-3 (4) cm in diameter, dissected to $\frac{2}{3}$ into oblong-elliptic or oblong-ovate lobes, these scarcely overlapping at the margins; capsule 0.8-1 (1.2) cm long; leaves commonly obtuse, rarely short-acuminate, elliptic or obovate to oblong, on flowering shoots 0.8-3.3 cm long, 0.6-1.1 cm broad. 12. *Rh. dahuricum* L.
 + Corolla larger, 2.2-3.3 cm long, the less open limb 3.5-5 cm in diameter, cut up to the middle into broad or nearly orbicular lobes; capsule larger, 1.1-1.7 cm long, on a stipe 0.8-1.1 cm long; leaves elliptic to oblong, usually pointed at both ends, 2-8 cm long, 1.2-2.5 cm broad 11. *Rh. mucronulatum* Turcz.
15. Corolla 1.6-2.2 cm long, incised to $\frac{2}{3}$ - $\frac{3}{5}$, the wide-open limb 2.8-4.5 cm in diameter, the lobes elliptic, not overlapping or slightly overlapping; capsule 0.7-1 cm long, on a stipe 0.5-0.7 mm long; leaves ovate-elliptic or obovate-elliptic, on flowering shoots 0.6-2.7 cm long and 0.4-1.3 cm broad, sparsely glandular above 4. *Rh. Ledebourii* Pojark.
 + Corolla large, 2.1-2.7 cm long, incised to the middle, the limb less open, 3-4.5 cm in diameter, the broad or orbicular limbs with overlapping margins; capsule 0.9-1.3 cm long, on a stipe 0.9-1.4 cm long; leaves larger, 1.7-3.5 cm long, 0.9-2 cm broad, densely glandular on both sides 13. *Rh. sichotense* Pojark.
- 34 16. Corolla rose-colored or rosy-red, the cylindric tube much longer than the patellate limb; stamens short, included in the corolla tube. 17.

- + Corolla rosy-purple, broadly campanulate, the limb several times as long as the tube; length of stamens equaling or exceeding the corolla. 18.
- 17. Corolla rosy-red, scaly-glandular outside; filaments of stamens hairy at base; pedicels 5-9 mm long 8. **Rh. Kotschyi** Simk.
- + Corolla pale pink, naked outside; flowers sessile; filaments of stamens glabrous 7. **Th. Adamsii** Rehd.
- 18. Stamens 10, the filaments hairy in lower part; leaves oblong-obovate, 10-20 mm long; a low erect shrub 9. **Rh. parvifolium** Adams.
- + Stamens 5-8, the filaments bearded at the very base; leaves ovate, 4-10 mm long; a decumbent shrub 10. **Rh. Lapponicum** (L.) Wahlenb.

Subgenus I. **LEIORHODIUM** (Rehd.) Pojark. comb.n.; Rehd. in Bailey, Stand. Cyclop. horticult. V (1916) 2937, sub sect.—Sect. Eurhododendron DC. Prodr. VII, 2 (1839) 721, p.p.; Maxim. in Mém. Acad. Sc. Pétersb. VII sér. XVI (1870) 14, 19 (p.p.: Candelabra et Chrysantha).—Flowers in leafless corymbose or umbellate inflorescences, from a terminal bud; bud scales numerous, imbricated in several ranks, the inner ones somewhat longer than the outer; leafy shoots from lateral buds situated below the blossom bud; corolla campanulate or funnelform; stamens 10-20; ovary 5- or 7-10-celled; leaves evergreen, glabrous above, tomentose beneath; glandular scales wanting.

Series 1. **Pontica** E. Busch.—Flowers rosy-violet, the bud scales caducous; tall shrubs with glabrous leaves. In addition to *Rh. ponticum* L. the series includes *Rh. baeticum* Boiss. et Reut. from the Iberian Peninsula.

1. **Rh. ponticum** L. Sp. pl. (1762) 562; M.B. Fl. taur.-cauc. I, 311; DC. Prodr. VII, 2, 721; Ldb. Fl. Ross. II, 919; Boiss. Fl. or. III, 971; Kuzn. in Mat. Fl. Kavk. IV, 1, 14; Medv. Der. i kust. Kavk. (1919) 196; Grossg. Fl. Kavk. III, 200.—*Rh. lancifolium* Moench, Meth. pl. (1794) 45.—*Rh. ponticum* b. *brachycarpum* Boiss. Fl. or. III (1875) 971.—*Azalea lancifolia* Kuntze, Rev. gen. II (1891) 386.—*Hymenanthus pontica* Copeland in Ann. Midl. Nat. XXX (1943) 614.—Ic.: Pall. Fl. Ross. tab. 29.—Exs.: Fl. cauc. exs. No. 41.

35 An evergreen shrub or tree, 1-6 (8) m tall, with brown or cerise-brown bark; leaves oblong-lanceolate, acute, narrowed toward base, entire, slightly revolute at the margin, 9-27.5 cm long, 2-9 cm broad, evergreen, coriaceous, dark bluish-green above, pale beneath, the petioles 1.3-3 cm long; flowers in corymbose umbels with a short rachis; pedicels 2-4.5 cm long in flower, 4-5 cm in fruit, glabrous or slightly glandular, the subtending scales ciliate-margined, 2 cm long, 1-1.2 cm broad; calyx minute, discoid, glabrous or slightly glandular, with triangular or very slightly rounded teeth, 0.5 m long, 1.5-2 mm broad; corolla violet-rose, rarely whitish-rose, 3.8-5 cm long, 4.5-6 cm in diameter, campanulate-funnelform, somewhat fleecy inside at the base, the oblong lobes spreading; filaments of stamens slightly curved, rather sparsely hairy on the lower one third; anthers 2.5-3 mm long; ovary finely glandular; capsule cylindric, glabrous, 1.5-1.8 cm long. June-July.

Woods, up to 2000 m. — Caucasus: Cisc. (W.), W. Transc. **Gen. distr.:** Bal.-As. Min., Arm.-Kurd. Described from the Caucasus. Type in London.

Note. An early Tertiary relict. Distributed in the Caucasus through N. Anatolia to the Bosphorus and along the east coast of the Balkan Peninsula to the Istranca Mts., from where var. *Scorpilii* Domin. was described. Another variety — var. *brachycarpum* Boiss., erroneously named by Maleev var. "*brachyscapum* Boiss." in "Geobotany" (*Geobotanike*) (IV, 1940, 209), is associated with Lebanon and Syria.

Economic importance. A handsome decorative shrub, sometimes growing into a tree up to 8 m high. The wood is firm, hard, reddish, beautifully patterned, suitable for turning.

Series 2. *Adjarica* E. Busch. — Flowers white or rose, the bud scales caducous; leaves floccose-tomentose beneath with white or light-brown hairs; tall erect shrubs. The series contains two Caucasian relict species with very restricted distribution areas.

2. *Rh. Ungernii* Trautv. apud Rgl. in *Gartenfl.* (1885) 335 and in *Tr. Bot. Sada*, IX, 2 (1886) 514; *Alb. Prodr. Fl. colch.* 164; Kuzn. in *Mat. Fl. Kavk.* IV, 1, 20; *Medv. Der. i kust. Kavk.* 198. — *Ic.:* *Bot. Mag. tab.* 8332. — *Exs.:* *Fl. cauc. exs.* No. 122; *Herb. Fl. Cauc.* No. 487.

An evergreen shrub, 3.5-6 m tall, the old branches with brown bark and triangular sand-colored leaf scars; branches of the current year white-tomentose; leaves obovate, terminating in a mucro 1-3 mm long, cuneate-attenuate at base, 12-22 cm long, 3.5-7.5 cm broad, evergreen, coriaceous, glabrous above, densely covered with white floccose tomentum, the petioles 1.8-2.5 cm long; flowers in a 15-20-flowered corymbose umbel with an elongated rachis; pedicels 2.5-3.5 cm long in flower, elongating to 3-5 cm in fruit, glandular, tomentose, the subtending scales ovate, terminating in a short point, glandular at apex, tomentose, 1.3-2 cm long; 0.8-1.2 cm broad; calyx 5-parted, the teeth linear-lanceolate 3-10 mm long, 0.8-1.2 mm broad, glandular and sparsely tomentose outside; corolla whitish (somewhat creamy), with petals sometimes reddish on the back, greenish on the margin within, campanulate, pubescent without and within, 3-3.5 cm long; filament of stamens thickened and glabrous at base, densely pubescent above the base and again glabrous upward; style somewhat curved, glabrous; capsule oblong, covered on the outside with rusty glandular hairs, 1.2-1.5 cm long. *Fl.* second half of May — beginning of July.

Woods, at altitudes of from 700 to 1700 m. — Caucasus: W. Transc. (*Adzharistan*). **Gen. distr.:** Turkish Lazistan [*Rize-Coruh*]. Described from *Khinzart* (former *Artvin Province*). Type in Leningrad.

Note. A Tertiary relict, associated with localities rich in Tertiary species. *Rh. Ungernii* can hardly be considered intermediate between *Rh. ponticum* L. and *Rh. caucasicum* Pall., as postulated by N.I. Kuznetsov. A good distinguishing character is provided by the dense white floccose tomentum which is absent in *Rh. ponticum*, while in *Rh. caucasicum* Pall. the tomentum is altogether different, being compact, fine, rusty, and sometimes confined to the veins.

Economic importance. A very handsome tall shrub, suitable for cultivation as an ornamental plant.

3. **Rh. Smirnovii** Trautv. apud. Rgl. in Gartenfl. (1885) 331 and Tr. Bot. Sada, IX, 2 (1886) 513; Alb. Prodr. Fl. colch. 165; Kuzn. in Mat. Fl. Kavk. IV, 1, 22; Medv. Der. in kust. Kavk. (1919) 198.—*Rh. lazicum* Massalsk. Massalsk. in Nov. obozr. (1886) No. 846.—*l.*: Bot. Mag. tab. 7495; in Rev. hort. (1889) 500, tab.—*Exs.*: Fl. cauc. exs. No. 121.

37 An evergreen shrub, 1-1.5 m tall, the old branches covered with gray bark; branches of the current year densely white-tomentose; leaves oblong-elliptic, obtusish, cuneate-attenuate at base, tubular-revolute when young, later slightly revolute, 8-15 cm long, 2.5-3.5 cm broad, coriaceous, green and lustrous above, densely white-tomentose beneath, the petiole 1-2.5 cm long; flowers 10-14 in a corymbose umbel with a short rachis; pedicels 2.8-3.5 cm long in flower, 3-5.5 cm in fruit, tomentose, glandular, the subtending bud scales elliptic, terminating in a point 2-8 mm long, tomentose, 1-2 cm long, 0.5-0.8 cm broad; calyx minute, tomentose without, the 5 broadly rounded lobes 0.5 mm long, 2-2.5 mm broad; corolla bright carmine-purple, the tube obscurely hairy, 3.5-4 cm long; filaments of stamens densely pubescent from base to $\frac{1}{3}$ height; ovary densely white-tomentose; style scarcely curved, glabrous; capsule oblong, densely white-tomentose at first, when ripe, 1.5-2 cm long.

Woods. This species has been included as there is a possibility that it may be found in the USSR. **Gen. distr.**: Artvin [former] province of Turkey. Described from Coruh R. Type in Leningrad.

Note. Like *Rh. Ungernii*, this species is a Tertiary relict with a very restricted distribution area in the former Artvin Province. A number of authors (Massal'skii and some later ones) favor the unification of *Rh. Ungernii* and *Rh. Smirnovii* into a single species. This is not justified since the two differ markedly. In *Rh. Ungernii* the leaves are 12-22 cm long and terminate in a point, while in *Rh. Smirnovii* the leaves are obtuse, 8 to 15 cm long. Calyx-teeth of *Rh. Ungernii* attain 3-10 mm in length, whereas these of *Rh. Smirnovii* are extremely reduced in length and are much broader than long. Filaments of stamens in *Rh. Ungernii* are enlarged at the base and pubescent above the enlarged part through about half the length of the filament; in *Rh. Smirnovii* the filaments are pubescent from the very base and the pubescence is confined to the lower one-third. Corolla of *Rh. Ungernii* is white or faintly creamy with a green margin and the lobes are sometimes rose on the back; the corolla of *Rh. Smirnovii* is purple. The two species also differ in height, *Rh. Smirnovii* being shorter than *Rh. Ungernii*. Both young and old branches of *Rh. Smirnovii* are more densely tomentose, particularly the buds.

Series 3. **Aurea** Pojark.—Flowers yellow; leaves glabrous beneath. Two species, in Siberia and the Far East.

4. **Rh. hypopitys** Pojark. sp. n. in Addenda XVII, 721.

An evergreen branched shrub, ca. 1 m tall; shoots of the preceding and the current year reddish-brown, stout, 4-8 mm in diameter, minutely puberulent; old branches covered with light brownish-gray bark; buds large, the leaf buds conical, ca. 15 mm long and 6 mm in diameter, the flower buds subglobose, ca. 17 mm long and 14 mm in diameter; outer scales multiseriate, coriaceous; glabrous or sparsely pilose, ovate, abruptly narrowed into a mucro, the others long, oblanceolate or the

innermost linear, herbaceous, densely appressed-pilose, all caducous or a few inner ones persistent; leaves (6) 9-15.5 cm long, excluding petiole, (2) 3-7 cm broad, firmly coriaceous, bright green above, pale beneath, glabrous on both sides, oblong-elliptic or oblanceolate-elliptic, gradually narrowed to a cuneate base, short-attenuate at apex to a callous point, 38 flat or slightly revolute at the margin, the prominently reticulate veinlets concave on the upper surface and somewhat convex and dark colored beneath; petioles stout, glabrous or puberulent, 1/10-1/4 as long as the blade; inflorescence an umbellate corymb; peduncles (3) 4-6 cm long, rusty-tomentose; inserted in the axils of bud scales; calyx depressed, 3-3.5 mm in diameter, obscurely 5-toothed, rusty-tomentose; corolla broadly campanulate, yellow (according to one of the labels-stramineous), turning greenish on drying, ca. 3 cm long and 4-4.7 cm in diameter, dissected down to the middle into broadly elliptic or ovate-obtuse undulate-margined lobes; stamens 10, unequal, shorter than corolla; filaments hairy in lower part, the anthers ellipsoid; style longer than the stamens, about same length as the corolla; ovary rusty-tomentose; capsule up to 13-17 mm long, conical or ovoid-cylindric, nearly straight, the stipe 7-8 cm long. Fl. Mid-June to July (Plate I, Figure 1).

Coniferous woods, chiefly mixed spruce and fir, rarely deciduous, in the litter and in openings, singly or in groups. Infrequent. - Far East: Uda and Uss. (lower reaches of Amur R., coast of Tatar Strait and Sea of Japan, and on eastern slopes of Sikhote-Alin Range). Endemic. Described from northern part of Sikhote-Alin Range, from Tumen R. Type in Leningrad.

Note. *Rh. hypopitys* Pojark. differs from *Rh. aureum* Georgi in its leaves being 2-3 times as large, with a slightly revolute or almost flat margin; shoots 1 1/2-2 times as thick and long, with elongated internodes, attaining greater length. In shape and size of leaves it closely resembles *Rh. ponticum* L., but the bud scales in *Rh. hypopitys* are few and promptly caducous except for the innermost which are sometimes retained for 1-2 years, while the nodes of *Rh. aureum* are densely covered with bud scales which apparently persist up to 3-4 years. The two species differ markedly in their ecology; *Rh. hypopitys* grows in out-of-the-way spruce and pine forests, while *Rh. aureum* is associated with the alpine and subalpine zones. *Rh. hypopitys* attracted the attention of the agronomist A. P. Tantsyrev; and as far back as 1927 he sent samples of its leaves, together with a short description and a photograph, to the Central Botanical Garden (now the Botanical Institute of the Academy of Sciences of the USSR). He pointed out that this species is very rare and grows only in spruce-and -fir forests.

5. *Rh. aureum* Georgi, Reise, I (1775) 91, 214. — *Rh. chrysanthum* Pall. Reise, III (1776) App. 729; Ldb. Fl. Ross. II, 920; Turcz. Fl. baic.-; dahur. II, 205; Miyabe, Fl. Kuril. 247; Kom. Fl. Man'chzh, III, 205; E. Bush in Fl. Sib. i Dal'n. Vost. II (1915) 15; I. Kuzn. in Fl. Az. Ross. 9, 18; Kom. Fl. Kamch. II, 359; Hulten, Fl. Kamtsch. II, 11; Kryl. Fl. Zap. 39 Sib. IX, 2107; Sugawara, III. Fl. of Saghal. IV, 1471. — Ic.: Pall. Reise,; III (1776) tab. N, f. 1, 2; Fl. Ross. I (1784) tab. 30; E. Bush, l.c. 16; Sugawara, l.c. tab. 672.

An evergreen shrub, 20 cm-1 m tall, with dark-brown bark; shoots short, 1.5-4.5 mm in diameter; leaves oblong-elliptic to broadly elliptic or obovate, cuneately narrowed toward base, entire, revolute,

(1.3) 2-8 (9) cm long, (0.8) 1-2.7 cm broad, wintering, coriaceous, glabrous, reticulate on both sides, dark green and lustrous above, paler beneath, the petioles 6-15 mm long; inflorescence a 3-5 (8)-flowered umbellate corymb; pedicels 2.4-4.5 cm long in flower, elongating to 3.5-7 cm in fruit, rusty-lanate, the subtending scales ovate, glandular-pubescent, 1-1.5 cm long, 0.6-1 cm broad; calyx rusty-lanate, the teeth very short, inconspicuous; corolla pale yellow, 1.8-3 cm long, broadly campanulate, the lobes rounded-elliptic; filaments curved, pubescent at base; anthers up to 2 mm long; style slightly longer than the corolla; ovary rusty-lanate; capsule oblong, 1.0-1.5 cm long. Fl. May-June; fr. July-August (Plate I, Figure 2).

Forming thickets in the high-mountain area, in the alpine and subalpine zones, sometimes descending into the upper part of the mountainous forest zone.— Arctic: An., W. Siberia: Alt.; E. Siberia: Ang.-Say., Dau., Lena-Kol.; Far East: Ze.-Bu., Uda, Uss., Sakh. (Sakhalin and N. Kurile Is.), Kamch. **Gen. distr.:** N. Mong. (Lake Khubsugul), Japan. Described from Baikal Range. Type in Leningrad.

Note. Differs from the outwardly similar and closely related species *Rh. caucasicum* Pall. in the glabrous undersurface of leaves, flower color (the corolla of *Rh. aureum* is pale yellow, while in *Rh. caucasicum* Pall. it is white or creamy, spotted greenish in the throat and sometimes fading into rose) and longer anthers (2 mm in *Rh. aureum*, 1-1.5 mm in *Rh. caucasicum*).

Economic importance. In the past the leaves were used medicinally. The inflorescence contains a bitter toxic substance andromedotoxin ($C_{31}H_{50}O_{10}$) and the glycosides ericolin and rhododendrin.

Series 4. *Caucasica* Pojark. — Flowers creamy-white, often fading into rose; leaves covered beneath with closely appressed brown tomentum. A single species in the Caucasus, closely related to the series *Aurea*.

6. ***Rh. caucasicum*** Pall. Fl. Ross. I, 1 (1784) 46; M.B. Fl. taur.-cauc. I, 311; III, 289; Ldb. Fl. Ross. II, 920; Boiss. Fl. or. III, 972; Medv. Der. i kust. Kavk. (1919) 197; Kuzn. in Mat. Fl. Kavk. I, 23.— *Azalea caucasica* Kuntze, Rev. gen. II (1891) 387.— Ic.: Pall. l.c. tab. 31.— Exs.: GRF, No. 371.

40 An evergreen shrub, 1-1.5 m tall, decumbent, with dark-brown bark; leaves oblong-oval, round-tipped or subacute, slightly revolute, narrowed toward the base, 4.5-12 cm long, 1.8-4 cm broad, wintering, coriaceous, glabrous and reticulate above, very finely ferruginous-tomentose beneath, the petiole 0.5-1.7 cm long; inflorescence a corymb; pedicels 2-4 cm long, elongating in fruit to 3-4.2 cm, the subtending bracts oblong, tomentose, ciliate-margined, 1.5-2.5 cm long, 0.9-1.3 cm broad; calyx minute, tomentose, discoid, the triangular teeth tomentose, 0.5-1 mm long, 1.5-2 mm broad; corolla white, faintly creamy or cream-colored, spotted green within, sometimes fading into rose, the spots in the throat turning red, 2.5-3 cm long in diameter, broadly short-campanulate, glandular within at the base and up to 1/3; filaments curved, hairy at base, the anthers 1-1.5 mm long; ovary tomentose; capsule ferruginous-tomentose, oblong, 1.5 cm long. Fl. June-August.

Forming thickets in the high-mountain area and underbrush in subalpine birch and beech woods, and sometimes in the higher parts of beech forests;

not flowering in the high alpine zone (at altitudes of ca. 2900 m); ranging from 1600 to 3000 m.—Caucasus: Gr. Cauc., W. and E. Transc., reaching eastward to N. Armenia. **Gen. distr.:** Bal.-As. Min. (Turkish Lazistan [Rize-Coruh]), Arm.-Kurd. Described from Central Caucasus. Type in London.

Note. The advance of rhododendron thickets into the upper part of the forest zone can sometimes be observed. The Caucasian rhododendron is confined to the northern slopes, except for the western part of the Greater Caucasus where it occasionally occurs also on the southern slopes (for instance in Abkhazia near Kolakovskii). The absence of the Caucasian rhododendron on the southern slopes in localities less favored with snowfall than Abkhazia is due to susceptibility to frost injury where snow melts too early. In winters with poor snowfall, plants on the northern slopes also succumb to frost.

Economic importance: A very beautiful shrub, grown for ornament in gardens, though, unfortunately very rarely. The young leaves are readily eaten by goats and sheep.

Subgenus II. **OSMOTHAMNUS** Maxim. in Mém. Acad. Sc. Petersb. VII ser. XVI, 9 (1870) 15, pro sect.—*Osmothamnus* DC. Prodr. VII, 2 (1839) 715, pro gen.—Inflorescence developing from a terminal bud, leafless; bud scales few, the outer as long as the inner ones; leafy shoots developing from lower lateral buds; corolla campanulate or funnellform, the tube distinct, often fairly long, cylindric, straight or curved; stamens 5-10; ovary and capsule 5-parted; low shrubs; leaves small, coriaceous, biennial or rarely perennial, fragrant by round sessile scalelike glands; pubescence of glandular white hairs.

Series 5. *Fragrantia* E. Busch.—Corolla pale rose or cream, with a cylindric tube and patellate corolla; stamens not exceeding the corolla tube; style shorter than the ovary; pedicels short, exceeded by the bud scales; inflorescence subcapitate. In addition to our species, *Rh. Adamsii* Rehd., this section includes *Rh. anthropogon* D. Don from the Himalayas, *Rh. Collettianum* Aitch. et Hemsl. from Afghanistan, *Rh. anthropogonoides* Maxim., and *Rh. cephalanthum* Franch. from Central China.

7. ***Rh. Adamsii*** Rehd. in Publ. Arn. Arb. IX (1921) 190.—*Azalea* fragrans Adams in Mem. Acad. Sc. Petersb. II (1808) 332.—*A. pallida* Turcz. in Bull. Soc. Nat. Mosc. VII (1838) 96, nom. nud.—*Osmothamnus fragrans* DC. Prodr. VII, 2 (1839) 715; Ldb. Fl. Ross. II, 918.—*O. pallidus* DC. l.c. (1839) 715; Turcz. Fl. baic.-dah. II, 204.—*Rhododendron fragrans* Maxim. in Mem. Acad. Sc. Petersb. VII ser. XVI, 9 (1870) 16, non Paxt.—*Asmothamnus pallidus* Krasn. in Bot. zap. SPb. univ. I (1886) 204.—*Rh. pallidum* Dümml. in Gard. Chron. ser. 3, LIII (1913, Apr. 26) 264, non W. Wats. l.c. (1913, Apr. 12).—*Rh. anthropogon* E. Busch in Fl. Sib. i Dal'n. Vost. II (1915) 19, non D. Don.—*Rh. anthropogon* var. *fragrans* I. Kuzn. in Fl. Az. Ross. 9 (1916) 15.—Ic.: Adams, l.c. tab. 14; E. Busch, l.c. Fig. on page 20; I. Kuzn. l.c. Fig. 3.

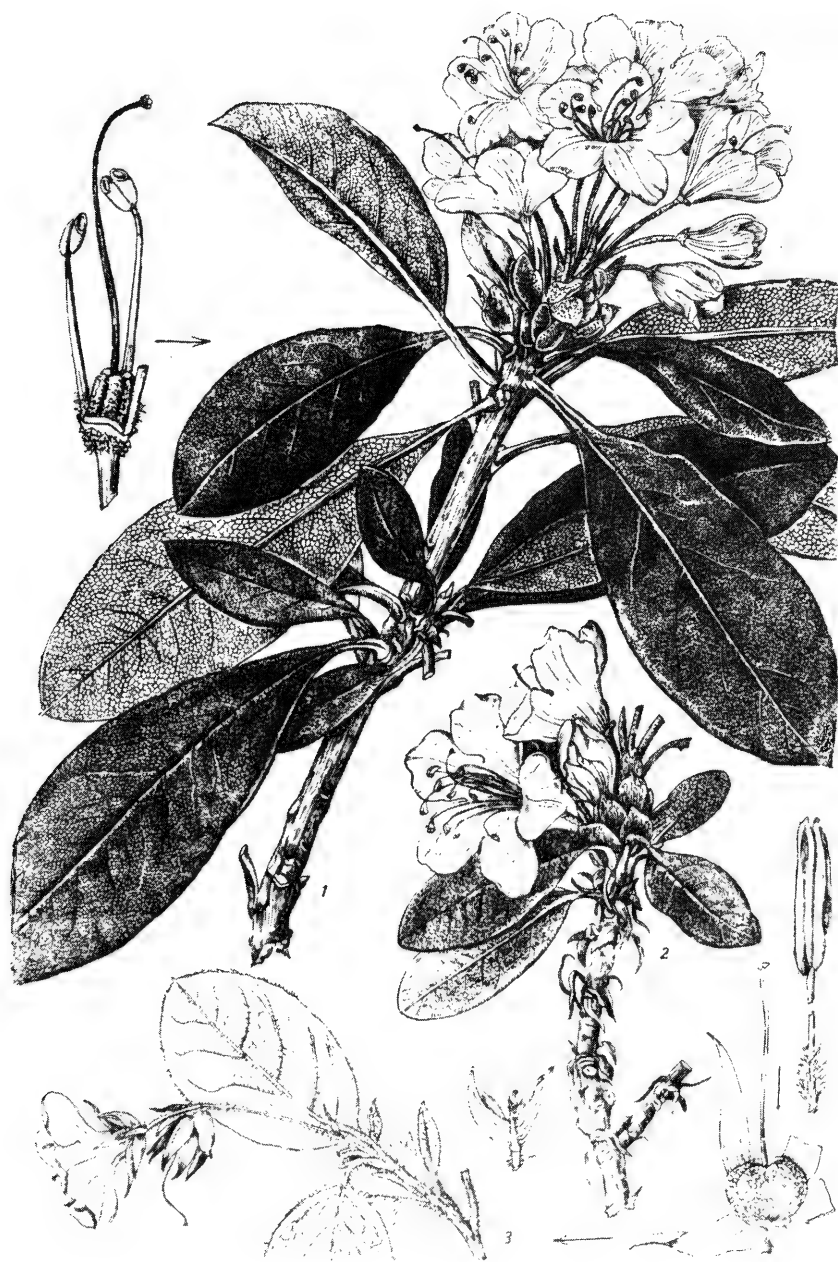


Plate I

1. *Rhododendron hypopitys* Pojark. 2. *Rh. aureum* Georgi. 3. *Epigaea gaultherioides* (Boiss. et Bal.) Takht.

44 A low evergreen shrub, 35-55 cm tall, with spreading branches; young branchlets hairy, densely ferruginous-squamose, the older ones covered with rugose exfoliate bark; leaves oblong-oval, mucronulate, obtuse at base, revolute at the margin, 10-20 mm long, 5-10 mm broad at the middle, coriaceous, the upper surface glabrous dull green and wrinkled by concave reticulation, the lower surface densely scaly-ferruginous, the petiole 1-3 mm long; flowers 7-15, subsessile, in a corymb, the subtending bud scales persistent, densely covered with rusty scales and ciliate on the margin, 4-5 mm long, 2-2.5 mm broad; calyx green, glandular-hairy, the teeth ovate, hyaline-margined, hairy, 1.25-3 mm long and 1-1.5 mm broad; corolla patellate, rose or pale-rose with a network of darker nerves, the tube cylindric, villous within, 6.5-8.5 mm long, the lobes spreading, rounded, slightly undulate-crenulate, 4.5-6 mm broad at the middle; stamens 5, sometimes more, included in the corolla tube; filaments glabrous; anthers almost round, 0.5-1 mm long; style 1/3-1/2 as long as the stamens; ovary subglobose, 5-celled; capsule subglobose, scaly, 3-6 mm long. Fl. June-July, rarely August.

Forming thickets in the alpine and subalpine zones and at the timber-line. -E. Siberia: Ang. -Say., Dau., Lena-Kol., Far East: Okh.

Gen. distr.: Mong. Described from the Lena Estuary. Type in Leningrad.

Series 6. **Myrtifolia** E. Busch. - Corolla rose-red, funnellform, the tube cylindric; stamens shorter than the corolla tube; style at most equal to twice the length of ovary; pedicels developed; inflorescence a 5-12-flowered corymbose umbel; leaves without glandular scales on the upper surface.

Beside *Rh. Kotschyi* Simk., this section includes two other species: *Rh. ferrugineum* L. (Alps, Apennines) and *Rh. hirsutum* L. (E. Alps, Illyrian Mts. and High Tatra).

8. ***Rh. Kotschyi*** Simk. Enum. Fl. Transsylv. (1886) 389; Prodan, Fl. Roman. (1923) 803; ed. 2 (1939) 703; Javorka, Magyar Fl. (1924) 800. - *Rh. alpinum* Lerchenfeld in Ziegl. De re silv. (1806) 30, nom. nud. - *Rh. hirsutum* Baumg. Enum. stirp. Transsylv. I (1816) 336, non L. - *Rh. myrtifolium* Schott et Kotschy in Flora, IX (1851) 18, non Lodd. - Ic.: Rchb. Ic. tab. 1157, f. 2-3; Prodan, Fl. Român. (1923) tab. II, f. 3; ed. 2 (1939) f. 492; Bot. Mag. tab. 9132.

A low evergreen shrub; young branchlets rusty-lepidote; leaves oblong-elliptic, obtusish or round-tipped, 1.5-2 cm long including point, 0.6-0.9 cm broad, coriaceous, the upper surface wrinkled by concave venation, green, glabrous and lustrous, the lower surface densely scaly-ferruginous, obscurely obtusely and flatly dentate with glands between the teeth, scarcely revolute, the petiole 3-5 mm long; flowers 5-7 in a corymbose umbel; pedicels glandular, 5-9 mm long, elongating in fruit up to 15-20 mm, surrounded by scales, densely ciliate-margined; calyx strongly glandular, the teeth oblong, 1.5-2 mm long, the hyaline margin strongly glandular; corolla rosy-red, sometimes white (f. *album* (Milais) Rehd.), the limb covered with scattered glands, the tube pilose without, villous within, 7-9 mm long; stamens 5, included in the corolla tube; filaments pubescent at base; style equaling the ovary; capsule oblong, 4-5 mm long. Fl. June-August.

Rocky and stony places in the alpine zone.—European part: U. Dns. (Carpathians). **Gen. distr.:** Centr. Eur., Balkans (Bulgaria). Described from Transylvanian Alps. Type in Budapest.

- Series 7. **Parvifolia** E. Busch.—Corolla pale-violet, broadly
45 funnelform-campanulate, with a short tube; stamens and style long, exserted; flowers pedicellate, 2-4 in umbellate clusters; leaves covered on both sides with glandular scales. The section contains two species represented in the USSR

9. **Rh. parvifolium** Adams in Nouv. Mem. soc. nat. Mosc. III (IX) (1834) 237; Ldb. Fl. Ross. II, 921; Turcz. Fl. baic.-dah. II, 206; Maxim. in Mem. Acad. Sc. Petersb. VII ser. XVI, 9 (1870) 17; Kom. Fl. Man'chzh. III, 204; E. Busch. in Fl. Sib. i Dal'n. Vost. II, 22; Kom. and Alis. Oprod. rast. Dal'nevost. kr. II, 841; Hulten, Fl. Aleut. isl. (1937) 259.—**Rh. ferrugineum** Georgi, Bemerck. Reis. Russ. Reich. I (1775) 213, non L.—**Azalea lapponica** Pall. Fl. Ross. I, 2 (1788) 52, tab. 70, non L.—**Rh. palustre** Turcz. in Shchegl. ukaz. 8, 3 (1831) No. 575, nom. nud.; DC. Prodr. VII, 2 (1839) 724; Turcz. Fl. baic.-dah. II, 206.—**Rh. parviflorum** Middend. Rast. Sib. (1867) 588; Rgl. in Gartenfl. (1874) 58.—**Rh. parvifolium** var. **alpinum** Glehn in Tr. Bot. Sada IV (1876) 66; E. Busch. in Fl. Sib. i Dal'n. Vost. II, 23.—**Azalea parvifolia** Kuntze, Rev. Gen. II (1891) 387.—**Rh. lapponicum** var. **parvifolium** I. Kuzn. in Fl. Az. Ross. IX (1916) 16; Hulten, Fl. Kamtsch. IV, 17.—**Rh. confertissimum** Nakai, Veg. Mt. Waigalbon (1916) 36, nom. nud.; in Tokyo Bot. Mag. XXX (1917) 239, descr.; Fl. sylv. Korean. VIII (1919) 32.—**Ic.:** Gartenfl. (1874) 59; Pall. Fl. Ross. I, 2, tab. 70, f. 1, A-B; E. Busch, l.c.f. A on page 24; Nakai, Fl. sylv. Korean. VIII, tab. 6, 8; Sugawara, III. Fl. of Saghal. IV, tab. 674.

A much-branched compact shrub, erect or decumbent (f. **alpinum** Glehn, **Rh. confertissimum** Nakai), 20-100 cm tall; young branchlets densely glandular-ferruginous, the old ones covered with dark-gray bark; leaves oblong-obovate or elliptic, obtusish, narrowed toward base, 11-20 mm long, 4-7 mm broad, slightly revolute, wintering, coriaceous, covered with glands on both sides, the glands of the lower surface light colored on young leaves, ferruginous on wintered leaves, the petiole 1-1.5 mm long; flowers 2-4 (5) in a corymb; pedicels rusty-glandular, 3-7 mm long, elongating in fruit up to 4.5-8 mm; calyx minute, the 5 lobes rounded, rusty-glandular; corolla open-campanulate, violet-rose, sometimes white (f. **albiflorum** Herd.), 9-14 mm long, 15-20 mm in diameter, hairy within from base to 1/4 of height, the lobes oval; stamens 10, mostly somewhat shorter than or rarely same length as the corolla, hairy in lower part, the filaments slightly curved; ovary ovaloid, rusty-lepidote, 5-furrowed; capsule ovaloid, rusty-lepidote, 3.5-5 mm long. Fl. May-July.

- Pine, birch, and other deciduous woods, and marches in the subalpine and alpine zones.—Arctic: Chuk., An.; E. Siberia: Ang.-Say, Dau., Lena-Kol.; Far East: Ze.-Bu, Uda, Sakh., Okh. **Gen. distr.:** Mong.,
46 Manchuria, Korea, Ber. (Aleutian Is.), N. Am. (Alaska). Described from Baikal Range. Type in Leningrad.

10. **Rh. lapponicum** (L.) Wahlenb. Fl. Lapp. (1812) 104; Fl. Suec. I (1824) 249; DC. Prodr. VII, 2, 724; Ldb. Fl. Ross. II, 920; Melo-Cajand. Suomen kasvio (1906) 447; Small in N. Amer. Fl. 29, 1, 48, p.p. (excl. pl. As. et Unalashk.).— *Azalea lapponica* L. Sp. pl. (1753) 151.— Ic.: Drude in Engl.— Pr. Pflanzenf. IV, 1, 36, f. 24, B; Fedch. and Fler. Fl. Evrop. Rossii, Fig. 509; E. Busch. l.c. on page 24, Fig. B.

Prostrate or almost prostrate shrub, 5-12 cm tall, with spreading branches; young branchlets densely glandular-ferruginous, the old ones covered with dark-gray bark; leaves ovate, obtusish, slightly narrowed toward the base, slightly revolute, 4-10 mm long, 2-4.5 mm broad, coriaceous, covered on both sides with glands, the petiole 0.5-1 mm long; flowers 3-6 in a corymb; pedicels rusty-glandular; 2-7 mm long, elongating to 6-10 mm in fruit; calyx minute, the 5 lobes triangular to triangular-ovate, rusty-glandular, the margin long-ciliate; corolla open-campanulate, violet, sometimes white, 7-10 mm long, ca. 1.5 cm in diameter, slightly hairy at base within; stamens 5-8, slightly exceeding the corolla, hairy only at the very base, the filaments gently curved; ovary ovoid, rusty-lepidote; capsule ovoid, rusty-glandular, 3.5-4.5 mm long.

Rocks and stony places in the mountain-tundra and alpine zones. In the USSR not yet found in the Kola Peninsula. **Gen. distr.:** Arctic (Greenland, Scand. (N. Finland and N. Sweden), N. Am. (Labrador and in the alpine zone of New England and of New York State).

Note. *Rh. lapponicum* (L.) Wahlenb. is confined to the areas noted above. Reports for N. Asia and parts of the Anadyr and Chukchi areas are false and should be referred to *Rh. parvifolium* Adams, as this author places *Rh. lapponicum* in Siberia, the east and extreme northeast of Asia, the Bering Sea area, and Alaska. A more or less prostrate and relatively small-leaved form of this species, which has been described as a distinct species (*Rh. confertissimum* Nakai), is outwardly very similar to *Rh. lapponicum* and has often been mistaken for that species.

Subgenus III. **RHODORASTRUM** (Maxim.) Drude in Engl.— Pr. Pflanzenf. IV, 1 (1897) 37; Maxim. in Mem. Acad. Sc. Petersb. VII ser. XVI (1870) 15, 43, pro sect.; Rehd. et Wilson in Sarg. Pl. Wilson, I (1913) 515, pro sect.— *Rhododendron* sect. *Lepipherum* G. Don, Gen. syst. III (1834) 845, p.p.— Flower buds lateral, leafless, giving rise to 1 or 2 flowers, with numerous imbricated scales; corolla broadly campanulate or funnelform-campanulate; stamens 10; leaves perennating or deciduous, developing from buds inserted below the blossom buds, bearing flat round sessile squamaceous glands. In addition to the three species occurring in the USSR, the section contains several Chinese and Himalayan species.

Series 8. **Daurica** Pojark.— Corolla broadly campanulate, narrowed into a very short tube; buds giving rise to solitary flowers; leaves soft-leathery or thin-textured, deciduous in fall or wintering and shed after flowering and unfurling of new leaves. The series contains the 4 species described below.

11. **Rh. mucronulatum** Turcz. in Bull. Soc. Nat. Mosc. VII (1837) 155; DC. Prodr. VII, 2, 727; Turcz. Fl. baic.-dah. II, 208; C.K. Schn. Laub-

holz. II, 472 (excl. syn. Maxim.); Nakai, Fl. sylv. Koreana, VIII, 35; Kom. and Alis. Opred. rast. Dal'nevost. kr. II, 41, p.p.—*Rh. dahuricum* β *mucronulatum* Maxim. in Mem. Acad. Sc. Petersb. VII ser. XVI, 9 (1870) 44, p.p.; Kom. Fl. Man'chzh. III, 203; p.p.; E. Busch in Fl. Sib. i Dal'n. Vost. II, 32, p.p.—*Rh. dahuricum* Nakai, Fl. sylv. Koreana, VIII (1919) 33, non L.—Ic.: C.K. Schn. l.c. f. 314, c-d, 316, a-b; Bot. Mag. tab. 8304; E. Busch, l.c., Fig. B-C on page 32; Nakai, l.c. tab. 9, 10, 11.

48 A shrub 1-3 m tall, with gray bark; young shoots strict, usually several in fascicles at the ends of branches, rusty-brown, puberulent and covered with round sessile squamaceous glands; leaves all shed before winter, not curling up in fall, thin, the upper surface bright green and sparingly covered with squamaceous glands and puberulent along the midrib, the lower surface pale green or glaucescent, more densely lepidote, the lamina and margin beset with long sparse bristlelike hairs (dense in var. *ciliata* Nakai), elliptic to oblong-elliptic, long-acuminate or acute, occasionally some subobtuse, terminating in a short blunted callous point, remotely and finely crenulate, sometimes recurved in upper part, (2) 3-8 cm long, (0.8) 1.2-2.5 cm broad; flowering before the leaves appear; blossom buds solitary or mostly approximate in a terminal cluster of 3-6 (8); pedicels 6-8 mm long, concealed by the bud scales, these coriaceous, ferruginous-brown, orbicular or broadly ovate, the middle part entirely covered outside with squamaceous glands, the margin white-fimbriate; calyx minute, 2.5 mm in diameter, short-truncate, 5-angled, the obsolescent teeth glandular throughout; corolla light purple-rose, sometimes white (var. *albiflorum* Nakai), more or less hairy outside, 2.2-3.3 cm long, 3.5-5 cm in diameter, funnelform-campanulate, dissected down to the middle into orbicular or broadly ovate obtuse hairy-margined somewhat overlapping lobes; stamens 10, the upper shorter than the corolla, the lower somewhat exserted; filaments densely covered below the middle with flattened white hair; anthers rounded-elliptic, dark purple; style exceeding the stamens, purple, curved, glabrous; ovary densely scaly-glandular; capsule oblong, 1.1-1.7 cm long, straight or curved, borne on a stipe 0.8-1.1 cm long. Fl. May-Mid-June; fr. July-August (Plate II, Figure 2a, ab).

Rocks, stony screes, dry slopes, and mountain crests; in scrub and among undergrowth of mixed coniferous and broadleaf forests, mostly in dry gravelly soil, as solitary shrubs or in clumps.—Far East: Uss. SW. - (Pos'et area, vicinity of Vladivostok, S. part of the Ussuri basin).

Gen. distr.: N. China (Hopei, Shantung, S. Manchuria), Korea, Japan (Kyushu Is.). Described from the vicinity of Peking. Type in Kharkov; type duplicate in Leningrad.

Note. *Rh. mucronulatum* Turcz. differs from *Rh. dahuricum* L. in having larger flowers, the less curved limb dissected only down to the middle into broad almost round somewhat overlapping lobes; capsule larger, borne on a longer stipe; leaves mucronate, always beset with sparse or often crowded bristlelike hairs, which are long only on the lower part of the capsule. The two species also differ in their distribution area and converge only in the south of the Ussuri area as defined in "Flora of the U. S. S. R." *Rh. mucronulatum* does not occur farther north. However, Russian systematicians and florists, beginning with Maksimovich, have erroneously reported *Rh. mucronulatum* for the whole of the Far East and

Transbaikalia. Turchaninov, while distinguishing clearly between *Rh. mucronulatum* and *Rh. dahuricum* in "Fl. baic.-dah.", treated *Rh. mucronulatum* side by side with *Rh. dahuricum*, as being related to the Chinese species and supplied it with a more detailed description than that provided by the original diagnosis. On the other hand, Maksimovich incorporated *Rh. mucronulatum* Turcz., as a variety, in *Rh. dahuricum* L. and, as shown by his listed herbarium specimens and descriptions, he included in this variety large-leaved and otherwise stronger (woodland) specimens of *Rh. dahuricum*.

12. *Rh. dahuricum* L. Sp. pl. (1753) 392 ("dauricum"); Pall. Fl. Ross. I, 1 (1784) 47 ("davuricum") p.p. (excl. pl. altaic.); Ldb. Fl. Ross. II, 921 ("davuricum") p.p. (excl. pl. altaic.); Turcz. Fl. baic.-dah. II, 207 (excl. syn. Ldb.); Maxim. in Mem. div. sav. Acad. Sc. Petersb. IX (1859) 189.—*Rh. dahuricum* β . *roseum* et γ . *album* DC. Prod. VII, 2 (1839) 725.—*Rh. dahuricum* α . *dahuricum* Maxim. in Mem. Acad. Sc. Petersb. VII ser. XVI, 9 (1870) 44, p.p. (excl. pl. altaic.); Kom. Fl. Man'chzh. III (1907) 201; E. Busch in Fl. Sib. i Dal'n. Vost. II, 31; I. Kuzn. in Fl. Az. Ross. 9, 23.—*Rh. dahuricum* β . *mucronulatum* Maxim. in Mem. Acad. Sc. Petersb. VII ser. XVI, 9 (1870) 44, p.p. (quoad pl. *dahur. amur.*); Herder in Tr. Bot. Sada, II, 347 (excl. pl. e. Possiet); Kom. Fl. Man'chzh. III, 201, p.p.; E. Busch. l.c. 31, p.p.; I. Kuzn. l.c. 23, p.p.; Kom and Alis. Opred. rast. Dal'nevost. kr. II, 841, p.p.—*Rh. dahuricum* α . *genuinum* Herd. l.c. 347.—Ic.: Pall. Fl. Ross. I, tab. 32; Bot. Mag. tab. 636; Rgl. in Gartenfl. (1874) 57; E. Busch, l.c.—Exs.: GRF, No. 424; Karo, Pl. Amur. et Zeaens, No. 380.

A much-branched shrub 0.5-2 cm tall, with erect branches; young shoots slender, usually several in fascicles at the ends of branches, rusty-brown puberulent and densely beset with round sessile glands; old branches covered with gray or brownish-gray bark; leaves soft-leathery, the upper surface laxly lepidote and puberulous along the midrib, initially bright green, the lower surface more densely and often completely covered with squamaceous glands, at first pale green and toward end of summer dark green, brownish beneath, (0.8) 1.2-3.3 cm long, (0.6) 0.8-1.1 cm broad, on sterile shoots up to 5.2 cm long and 2 cm broad, elliptic or oblong-obovate, rarely and mainly on sterile shoots oblong or narrowly elliptic, mostly obtuse, rarely acute, often emarginate, obtusely mucronulate, rolling up into a tube in fall (under drought conditions?), mostly falling before winter, few wintering and persisting until flowering time, unfurling again in spring, the new leaves developing after the flowers; petioles short, 1/10-1/8 the length of the blade; blossom buds usually solitary, rarely 2-3 near branch tip; pedicels 3-5 mm long, concealed at flowering time by surrounding bud scales; calyx 1.5-1.75 mm in diameter, green, lepidote throughout, the teeth obsolescent; corolla rose slightly suffused with violet, sometimes white (var. *albiflorum* Turcz.), hairy outside, campanulate-funnelform, 1.4-2 (2.2) cm long and 2.5-3 (4) cm in diameter, dissected to 2/3 into obovate to oblong-obovate or oblong-elliptic obtuse lobes 0.8-1.5 cm long and 0.5-1 (1.3) cm broad; stamens 10, equaling the corolla, the anthers violet-rose, the filaments barbed in lower part; style purple, exserted; ovary glandular-scaly throughout capsule oblong-ovoid, 0.8-1 (1.2) cm long, straight or slightly curved, on a stipe 3.5-7 mm long. Fl. end of April-June; fr. July-August (sometimes flowering again in September).

50 Coniferous or more often deciduous woods, outside the permafrost area; also in oak woods, especially in gravelly soil, on stony mountain slopes, on stony screes and rocks, singly or in clumps. — E. Siberia: Ang. - Say. (absent in E. Sayans), Dau., Lena-Kol. (S.); Far East: Ze.-Bu., Uda, Uss. **Gen. distr.:** Mong. (NE part), Manchuria (N. part). Described from Dauria. Type in London.

Note. *Rh. dahuricum* L. is a rather polymorphic species as regards height and habit as well as leaf shape. Plants growing on exposed slopes and mountain crests form a low compact and much-branched bush and produce relatively small leaves. On the other hand, plants growing under the cover of woods reach the height of 2 (3) m and produce longer rod-shaped sterile shoots, these bearing narrower leaves than those of the short flowering shoots and resembling in shape the leaves of *Rh. mucronulatum* Turcz. As regards such characters as the shape of flower and its parts and the dimensions of capsule, no differences have been discerned between plants of exposed and afforested habitats. The true *Rh. mucronulatum* Turcz. differs from *Rh. dahuricum* in leaf shape, and, more particularly, in the shape and size of the flower as well as the large capsule (c.f. note to preceding species). Pallas [?] and then Ledebour and all later authors have also included in *Rh. dahuricum* the rhododendron growing in the mountain forests of the Altai and Sayan ranges and described here as *Rh. Ledebourii* Pojark. (see note to that species). Finally, it is necessary to separate from *Rh. dahuricum* the rhododendron endemic for the east slope of the range (*Rh. sichotense* Pojark.) which, like *Rh. Ledebourii*, has wintering leaves with brown undersurfaces, differing in shape from those of other species of the section Dauricae; differently shaped flowers; and larger capsules (c.f. note to next species). It follows that four different geographical races have been included in *Rh. dahuricum* auct. fl. ross, which differ in a large number of morphological characters and in distribution. The true *Rh. dahuricum* L. s. str. grows in the area west of Lake Baikal, Transbaikalia, S. Yakutia, and the Far East, except for eastern slopes of Sikhote-Alin Range and SW part of the Ussuri area.

13. *Rh. sichotense* Pojark. sp. n. in Addenda XVII, 722. — *Rh. dahuricum* Kom. et Aliss. Oprod. rast. Dal'nevost. kr. II (1932) 841, non L.

51 A diffusely branched shrub with spreading branches; young twigs erect, virgate, arising in close bunches at the ends of branches; old branches with dark-gray bark; shoots of the current year reddish-brown, glabrous to densely puberulent, usually beset with round sessile squamaceous glands; leaves wintering, rolling up into a tube in fall and unfurling again in spring; flowering in spring while covered with the preceding year's leaves, these shed with the unfolding of the new leaves; leaf blades coriaceous, thick, the upper surface dark olivaceous-green, the lower surface pale at first becoming brown, both sides, but especially the underside, densely covered with round squamaceous glands, destitute of bristlelike hairs and minutely puberulent above the midrib, mostly elliptic-ovate or rarely elliptic, broadly cuneate or rounded-cuneate at base, obtuse, often emarginate or short-pointed, terminating in a short callous projection of the midrib, almost entire or obscurely and distantly crenulate, 1.7-3.5 cm long,

0.9-2 cm broad; leaves of sterile shoots up to 4.5 cm long, 2.3 cm broad, usually narrower than those of fertile shoots, ranging in shape to oblong-elliptic; petiole pubescent and scaly-glandular, 1/10-1/5 as long as the blade; blossom buds solitary or 2-4 in the axils of approximate upper leaves of preceding year's shoots; pedicels 0.5-0.7 mm long, concealed by persistent scales; calyx 2-2.5 mm in diameter, glandular throughout, the obsolescent teeth rounded and glabrous; corolla funnelform-campanulate, 2.1-2.7 cm long, 3-4.5 cm in diameter, dissected down to the middle into broad rounded-ovate or broadly elliptic obtuse lobes, which do not narrow toward the base or narrow into a very short claw, the limb less expanded than in related species, the lobes being half-spreading with overlapping margins; stamens 10, the upper shorter than the corolla, the lower somewhat exerted, all filaments curved and barbed below the middle; anthers oblong-elliptic, violet-purple; style exceeding the stamens, purple, the stigma blackish-purple; ovary glandular over the entire surface; capsule borne on a stipe 9-14 mm long, oblong-cylindric to cylindric-ovoid, 9-13 mm long, 3-4 mm in diameter, usually straight. Fl. mid-May; fr. July (Plate II, Figure 1).

Stony slopes and crests, on rocks and large-stone screes, forming undergrowth in deciduous and dark coniferous mountain forests; occasionally penetrating into the mountainous tundra zone. Appearing as isolated shrubs or small clumps or thickets; sprawling in the "balds" zone.— Far East: Uss. (only on eastern slopes of Sikhote-Alin Range and along the seacoast from Olga Gulf to Sovetskaya Gavan). Endemic. Described from Olga Gulf. Type in Leningrad.

Note. Like *Rh. Ledebourii* Pojark., *Rh. sichotense* Pojark. does not shed its leaves in winter and blooms in spring or in early summer while clothed in the preceding year's leaves. It differs markedly from *Rh. Ledebourii* in the large size and the shape of leaves, the shape and color of corolla, and the large capsule. In flower shape and size it most closely resembles *Rh. mucronulatum* Turcz., from which it is distinguished by its wintering leaves which are broad, obtuse, dark green above and brown beneath, and are always devoid of bristlelike hairs (see note to preceding species).

14. *Rh. Ledebourii* Pojark. sp. n. in Addenda XVII, 722.—

Rh. dahuricum β . *sempervirens* Sims. in Bot. Mag. 44 (1817) tab. 1888.— *Rh. dahuricum* β . *atrovirens* Edw. in Bot. Reg. III (1817) tab. 194 (excl. synonym. plur.).— *Rh. davuricum* Ldb. Fl. alt., II (1830) 96; Fl. Ross. II, 921, p.p. (quoad. pl. alt.); Kryl. Fl. Alt. 792; Fl. Zap. Sib. IX, 2108.— *Rh. dahuricum* α . *dahuricum* Maxim. in Mem. Acad. Sc. Petersb. VII ser. XVI, 9 (1870) 44, p.p. (quoad pl. altaic. sajanens.); E. Buschin Fl. Sib. i Dal'n. Vost. II, 31, p.p.; I. Kuzn. in Fl. Az. Ross. 9, 23, p.p.— Ic.: E. Busch, l.c., p. 32, Fig. A, B.

A much-branched and densely leafy shrub 0.5-1.5 m tall, with very erect branches covered with dark-gray bark; young shoots slender, short, brown or reddish-brown, minutely pubescent and usually more or less covered with round sessile squamaceous glands; leaves wintering, softly coriaceous, falling after flowering and formation of new leaves, dark olivaceous-green lustrous and sparsely lepidote above, at first paler yellowish-green then brown and densely lepidote-glandular beneath, ovate-elliptic to elliptic, occasionally some obovate or oblong-elliptic, obtuse, often emarginate,

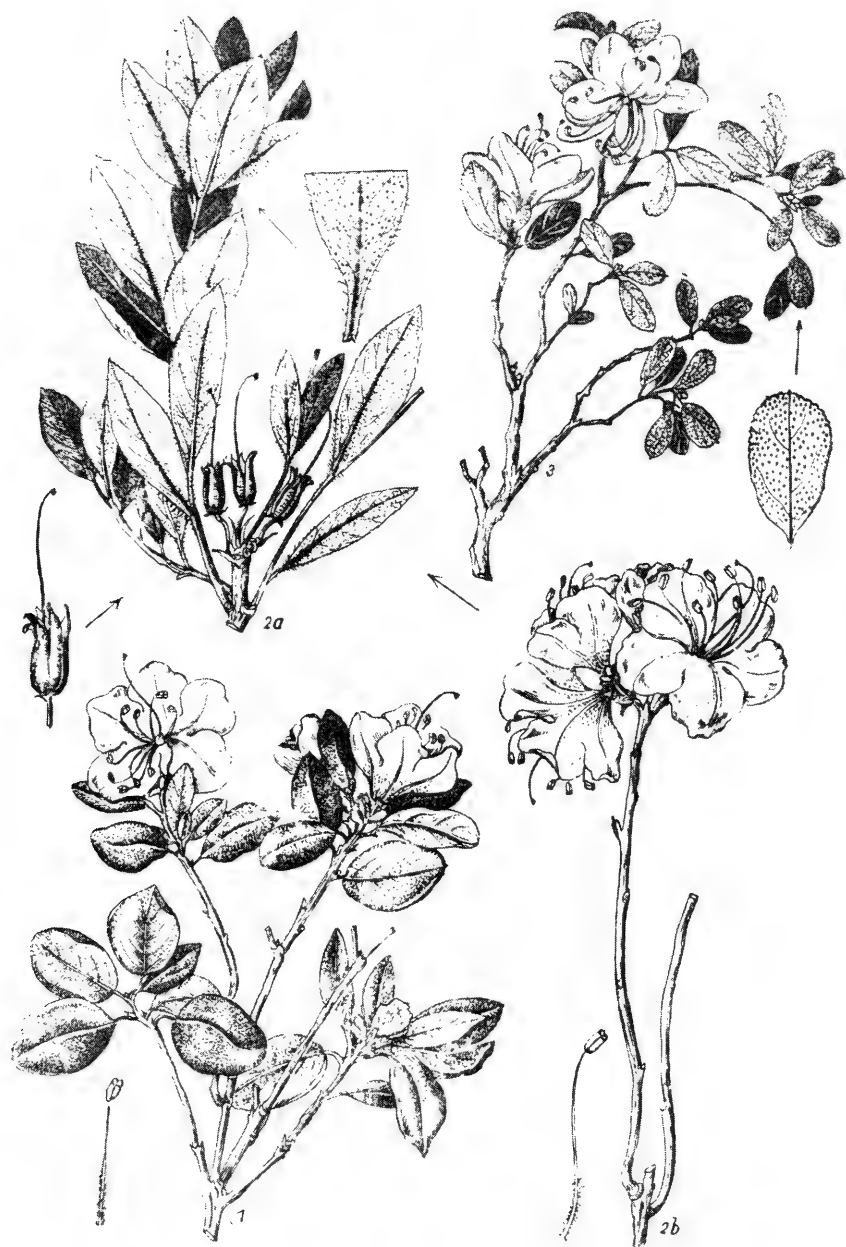


Plate II

1. *Rhododendron sichotense* Pojark. 2a, b. *Rh. mucronulatum* Turcz.: flowering and fruiting branchlet, a portion of leaf as seen from above, capsule, and stamen. 3. *Rh. Lebedourii* Pojark.

rarely acute or acuminate, terminating in a blunt callous point, obscurely crenulate, (0.6) 0.8-2.7 cm long and (0.4) 0.5-1.3 cm broad, on the long sterile shoots up to 3-4 cm long and 1.6-2 cm broad, the blade 3-5 times as long as the petiole; flower buds solitary or 2-3 in the upper leaf axils of the preceding year's shoots; calyx ca. 2 mm in diameter, faintly 5-angled, lepidote-glandular throughout except for the teeth, the ca. 0.5-1 mm long; corolla rose-violet, 1.6-2.2 cm long, campanulate-funnelform, the tube very short, the limb broad, expanded, zygomorphic, 2.8-4.5 cm in diameter, dissected to 2/3-3/5 of its length into elliptic or ovate lobes, these obtuse, exungiculate or attenuate into a short claw; stamens 10, slightly exceeding the corolla, the filaments rose-colored, barbed at base, the anthers elliptic, violet-rose; ovary faintly 5-angled, lepidote throughout; style curved, longer than the stamens, glabrous; capsule oblong-cylindric, 7-10 mm long, 3-4 mm broad. Fl. June-July, often flowering again, sometimes profusely, in August-September; fruit from August (Plate II, Figure 3).

Stony mountain slopes, stony screes and rocks; mountain forests, mostly deciduous, more rarely spruce, on the banks of mountain streams in the forest and subalpine zones.—W. Siberia: Alt.; W. Siberia: Ang.-Say. (S. part — the Sayans, Tannu-Ola Range, mountains west of the Yenisei).

Gen. distr.: Mong. (NW part). Described from the Altai. Type in Leningrad.

Note. Up to the present, *Rh. Ledebourii* Pojark. has been identified with *Rh. dahuricum* L. and apparently Russian botanists have not distinguished it. *Rh. Ledebourii* is endemic for the Altai, the Sayans, and mountains adjacent to the Sayans, and does not penetrate into the distribution area of *Rh. dahuricum* L. It is readily distinguished from that species by the rather intense rosy-violet color of its flowers and the wintering leaves which differ in shape, dark olivaceous-green above and soon turning brown beneath. This species, which has long been cultivated, drew the attention of English botanists by the above-mentioned characters and has been twice described as a variety of *Rh. dahuricum* and displayed in paintings under the names *Rh. dahuricum* var. *semper-virens* Sims and *Rh. dahuricum* var. *atrovirens* Edw.

Subgenus IV. **TSUTSUTSI** (G. Don) Pojark. comb. n.; G. Don, Gen. Syst. III (1834) 845, p.p. (excl. Nos. 30, 31, 36, 39), pro sect.; Wilson in Publ. Arn. Arb. 9 (1921) 22, s. str. pro sect.—*Azalea* L. Sp. pl. (1753) 150, p.p. quoad No. 1.—*Rhododendron* sect. *Tsusia* Maxim. in Medm. Acad. Sc. Petersb. VII ser. XVI, 9 (1870) 15, 32, (excl. No. 17).—Flowers 1-4 from terminal buds, the sterile shoots developing from the axils of the lower scales of these buds; bud scales in few series, imbricated, the outer about as long as the inner ones; corolla infundibular or campanulate-infundibular, with a short tube; stamens 5-10; hairs flat, bristlelike, brown, appressed, sometimes interspersed with glandular hairs; leaves spaced regularly along the entire shoot, biannual or annual, rarely perennial. About 25 species in the countries of East Asia.

15. **Rh. Tschonoskii** Maxim. in Mel. biol. VII (1870) 339; in Mem. Acad. Sc. Petersb. VII ser. XVI, 9 (1870) 42; Kudo in Jap. Journ. Bot. II (1925) 271; Vorob'ev in Tr. Dal'nevost. bazy AN SSSR, gen. ser. I (1948) 27.—*Azalea Tschonoskii* Kuntze, Rev. Gen. II (1891) 387.—

Rh. trinerve Franch. ex Boissieu in Bull. herb. Boiss. V (1897) 920.—
Ic.: Maxim. l.c. tab. 3, f. 8-14.

- 56 A low, dichotomously much-branched shrub; young shoots and the petioles and blades of leaves beset with appressed ferruginous hairs; leaves crowded at the summit of shoots, short-petioled, elliptic, acute, 1-2.2 cm long, 0.3-0.8 cm broad, dark green above, much paler beneath; flowers 2-4, short on pedicels 3-4 mm long, the corolla and the ovate-triangular calyx-lobes densely covered with long ferruginous hairs; corolla 7-9 mm long, whitish, funnelform-campanulate, the spreading limb ca. 8 mm in diameter, the lobes oblong-ovate, obtuse, the inside of the lower part and the upper part of the tube covered with short hairs; stamens 5, exserted; anthers oblong, brown on drying; style curved, about equaling the stamens; ovary densely beset with long ferruginous hairs; capsule ovoid, obtuse, glabrate in maturity. Fl. July.

Mountain slopes, among stony screes, together with *Pinus pumila* and *Empetrum nigrum*.—Far East: Sakh. (only on Kunashir Is.).

Gen. distr.: S. Korea, Japan (Hokkaido and N. part of Honshu Is.). Described from Honshu Is. Type in Leningrad.

Subgenus V. **SCIADORHODION** (Rehd. et Wils.) Copeland in Amer. Midl. Nat. XXX (1943) 597; Rehd. et Wilson in Publ. Arn. Arb. 9 (1921) 79, pro sect.—*Rhododendron* sect. *Tsutsutsi* G. Don. Syst. III (1834) 847, p.p.—*Rhododendron* sect. *Azalea* Maxim. in Mem. Acad. Sc. Petersb. VII ser. XVI, 9 (1870) 14, 24, p.p.—Flowers 1-3 from terminal buds, the sterile shoots developing from the axils of lower scales of the same buds; corolla rotate-campanulate; stamens (6) 8-10; hairs not bristlelike, not colored; leaves 3-5, in a terminal whorl, annual. Six species in the countries of E. Asia.

16. *Rh. Schlippenbachii* Maxim. in Bull. Acad. Sc. Petersb. XV (1871) 226; in Mel. biol. VII (1870) 333; in Mem. Acad. Sc. Petersb. VII, ser. XVI, 9 (1870) 29; Kom. Fl. Man'chzh. III, 206; E. Busch in Fl. Sib. i Dal'n. Vost. II (1915) 27; I. Kuzn. in Fl. Az. Ross. 9, 20.—*Azalea Schlippenbachii* Kuntze, Rev. Gen. II (1891) 387.—*Rh. "Schlechtenbachii"* Kitag. Lineam. Fl. Manshur. (1939) 349.—Ic.: Maxim. in Mém. Acad. Sc. Petersb. VII ser. XVI, 9 (1870) tab. II, f. 7-13; E. Busch, l.c. Fig. on page 27.

- 57 A shrub, 0.6-2 m tall, with a very spreading top; young branchlets short-glandular, pubescent, brown, the older ones glabrous, covered with light-gray bark; leaves broadly oboval, 4-9 cm long, 2.5-5 cm broad at the middle, cuneately attenuate into a short (2-4 mm) rusty-glandular petiole, the underside with 6-8 prominent hairy veins on both sides of the midrib, the midrib often tomentose, the margin entire and toward base ciliate; flowers 6-7 in umbellate corymbs, opening before or just with the appearance of leaves; pedicels glandular-hairy, 10-11 mm long in flower, elongating to 11.5-17 mm in fruit, surrounded by imbricated oval glandular-ciliate scales; calyx 5-parted, the lobes oval, 5-8 mm long, glandular-ciliate; corolla broadly rotate-campanulate, 5-7 cm in diameter, pale rose, purple-spotted at the mouth; stamens 10, curved, bearded at base; upper stamens half as long as the lower ones; style glandular at base, exceeding the stamens; capsule oblong-ellipsoid, glandular-scabrous, 11-18 mm long. Fl. April-May.

Dry stony mountain slopes, in small clumps. — Far East: Uss. (SW part).
Gen. distr.: Manchuria, Korea, islands of the Korean Archipelago, and Japan. Described from Korea. Type in Leningrad.

Subgenus VI. **PENTANTHERA** (G. Don) Pojark. comb. n.; G. Don, Gen. Syst. III (1834) 846, pro sect.; Rehd. et Wilson in Sarg. Pl. Wilson. I (1913) 549, pro sect. — *Azalea* L. Sp. pl. (1753) 150, p.p. quoad sp. Nos. 2-4. — *Rhododendron* sect. *Azalea* Maxim. in Mem. Acad. Sc. Petersb. VII ser. XVI, 9 (1870) 14, 24, p.p. — Flowers in umbellate inflorescences; flower buds terminal, with numerous imbricated scales, the outer short and caducous, the inner longer and persistent, the sterile shoots developing from lower lateral buds; leaves distributed regularly along the shoot, annual; flowers infundibular; stamens 5; hairs soft, simple, and glandular. Mainly North American species; a few East Asian; one species in the Caucasus, Asia Minor, and E. Europe.

17. **Rh. luteum** Sweet, Hort. Brit. ed. 2 (1830) 343; C.K. Schn. Laubholz. II (1912) 1046, non II (1909) 500; E. Wilson in Rehd. et Wilson in Publ. Arn. Arb. 9 (1921) 103. — *Azalea pontica* L. Sp. pl. (1753) 150; M.B. Fl. taur.-cauc. I, 144; III, 136; Ldb. Fl. Ross. II, 919; Medv. Der. i kust. Kavk. (1919) 199. — *Azalea flava* Hoffmannsg. Verz. Pflanzenkult. Nachtr. II (1826) 62. — *Anthodendron ponticum* Rchb. in Mössler, Handb. Gewächsk. 2 Aufl. I (1827) 309. — *Rh. flavum* G. Don, Gen. Syst. III (1834) 847; Shmal'g. Fl. II, 185; Kuzn. in Mat. Fl. Kavk. IV, 1, 31; C.K. Schn. Laubholz. II, 499. — *Rhododendron ponticum* Schreb. ex DC. Prodr. VII, 2 (1839) 718, pro syn. non L. — *Azalea pontica* var. *autumnalis* C. Koch in Linnaea, XVII (1843) 281; Ldb. Fl. Ross. II, 1919. — *Anthodendron flavum* Rchb. apud C. Koch, Dendr. II, 2 (1872) 184, pro syn. — Ic.: Pall. Fl. Ross. II (1788) tab. 69; Rchb. Ic. Fl. Germ. XVI, tab. 1159, f. 1-4. — Exs.: GRF, No. 627 (Kavk.); No. 2301 (Volyn'); Fl. cauc. exs. No. 189; H. Fl. Reipubl. Sowjet Ukrain. No. 91.

58

A shrub up to 2 m tall; leaves oblong-obovate to oblong-elliptic, thin, ciliate, pubescent or glabrous on both sides, 5.5-12 cm long, 2-3.8 cm broad, deciduous, the petiole 5-7 mm long; flowers in umbellate corymbs; pedicels 1-1.5 cm long in flower, elongating in fruit to 1.5-2 cm, glandular; bracts oblong, lanate, very viscid, promptly caducous, 1-1.5 cm long, 0.5-0.7 cm broad; calyx minute, dissected down to base into linear-lanceolate, obtuse, glandular-ciliate lobes 2.5-5 cm [?] long; corolla orange or yellow, glandular outside, 3-4.5 cm long, corolla tube narrowly cylindric, enlarged at the top, the lobes oblong, about one-third as long again as the tube; stamens 5, the filaments curved, hairy from base up to the middle; capsule oblong, 1.5-2.2 cm long. Fl. May-June.

Forest margins, in forests in pine undergrowth, and in clearings, up to 2000 m. — European part: U. Dnp., M. Dnp.; Caucasus: Cisc., Dag., W. Transc., E. Transc. (W. part, rarely in E. part). **Gen. distr.:** E. part of Centr. Eur. (Poland), Bal.-As. Min., As. Min. Described from the Pontic Range*. Type in London.

Note. Specimens from Belorussia and Volhynia do not differ in any way from Caucasian specimens. A virulently toxic plant. The nectar is

* [Kuzey Anadolu Mts.]

also toxic and causes the death of bees. The toxicity of the nectar is due to the presence of the toxic substance andromedotoxin $C_{31}H_{50}O_{10}$. The plants, when eaten, produce fatal poisoning in animals.

Economic importance. Cultivated in gardens for the beautiful blossom.

Subgenus VII. **THERORHODION** (Maxim.) Drude in Engl. — Pr. Pflanzenf. IV, 1 (1897) 37; Maxim. in Mem. Acad. Sc. Petersb. VII ser. XVI, 9 (1870) 15, 47, pro sect. — *Rhododendron* sect. *Chamaecistus* G. Don, Gen. Syst. III (1834) 845, p.p. — *Therorhodium* Small in N. Amer. Fl. 29, 1 (1914) 45. — Flowers 1-3 at the ends of long, young, leafy shoots; pedicels long, with 2 foliaceous bracteoles; corolla rotate, deeply dissected; stamens 10, the 5 upper ones longer than the others; ovary 5-locular; capsule thin-walled, subcoriaceous; leaves deciduous, long-ciliate on the margin. Two species, both occurring in the USSR in E. Siberia and the Far East, one of them penetrating as far as Alaska.

18. **Rh. kamtschaticum** Pall. Fl. Ross. I (1784) 48; Ldb. Fl. Ross. II (1846) 922; Maxim. in Mem. Acad. Sc. Petersb. VII ser. XVI, 9 (1870) 47; Miyabe, Fl. Kuril. 247; E. Buschin Fl. Sib. i Dal'n. Vost. II, 35; I. Kuzn. 59 in Fl. Az. Ross. 9, 23; Kom. Fl. Kamch. II, 360; Hulten, Fl. Kamtsch. IV, 14. — *Chamaecistus kamtschaticus* Rgl. Dendrol. III (1873) 196. — *Therorhodium kamtschaticum* Small in N. Amer. Fl. 29, 1 (1914) 45. — *Th. glandulosum* Standley in N. Amer. Fl. 29, 1 (1914) 45. — *Rh. kamtschaticum* var. *Pallasianum* Kom. Fl. Kamch. II, (1929) 360. — *Rh. kamtschaticum* var. *pumilum* E. Busch in Fl. Sib. and Dal'n. Vost. II (1915) 37. — *Ph. glandulosum* Standley in N. Amer. Fl. 29, 1 (1914) 45. — Ic.: Pall. l.c. tab. 33 (var. *Pallasianum*); Rgl. in Gartenfl. (1887) tab. 1260 (var. *Pallasianum*); Drude in Engl. — Pr. Pflanzenf. IV, 1 (1891) f. 24, C (var. *Pallasianum*); E. Busch. l.c. on page 37, Fig. A (var. *Pallasianum*), Fig. B (var. *pumilum*). — Exs.: GRF, No. 3098.

A branched shrub, 4-35 cm tall, the branches rough with scars of fallen leaves; leaves gathered in dense rosettes at the base of fertile shoots, the remaining leaves few, much scattered; leaves sessile, usually obovate, terminating in a gland, 12-22 mm long; sterile shoots densely leafy, their leaves mostly spatulate-oboval, attenuate toward base, 20-45 mm long, 10-25 mm broad (var. *Pallasianum* Kom.) or 14-20 mm long, 4-10 mm broad (var. *pumilum* E. Busch; var. *glandulosum* (Standl.) Hult.); leaves with 2-3 veins on both sides of the midrib, densely reticulate, ciliate on the veins beneath, the margin fimbriate-ciliate; fertile branchlets 1-2 (3)-flowered (in var. *glandulosum* 15-45 mm long, in var. *Pallasianum* 40-100 mm long), the bracts sessile oval foliaceous glandular-ciliate; calyx 5-lobed, the lobes oblong-oval, 9-14 mm long, 3-6 mm broad, glandular-ciliate; corolla 2.5-5 cm in diameter, pubescent outside, rotate, purple, the very short tube not exceeding 2-5 mm; corolla lobes 11-22 mm long, 7-10 mm broad, oblong-oval, the 2 lower ones somewhat longer than the others; stamens 10, villous at base, unequal, the 5 upper ones short, the lower ones twice as long; ovary villous; style villous at base, slightly curved, exceeding the stamens; capsule ovaloid. Fl. June-July.

On balds in the alpine zone, tundras, *Pinus pumila* thickets in high mountains, alder and birch groves.— Arctic: Arc. Sib., Chuk., An. Far East: Uss., Sakh. (Sakh. and Kurile Is.), Uda, Okh., Kamch. **Gen. distr.:** Japan (mountains), Ber. (Aleutian Is.), NW part of N. Am. (Alaska, Sitka). Described from Okhotsk area. Type in London.

30 Note. Hultén (Flora of Kamchatka) records the distribution areas of three subspecies of *Rh. kamtschaticum*. For subsp. *typicum* Hult.— S. and E. Kamchatka, Kurile Is., Komandorskie Islands, Aleutian Is., S. Alaska; for subsp. *glandulosum* (Standley) Hult. E. and N. Kamchatka, Ayan, Okh., Gizhiga, Chukchi Peninsula, N. Alaska; the third, subsp. *intercedens* Hult., diverges, according to Hultén, from the other two, and is distributed in Sikhote-Alin and Yablonovyi ranges, in the Uda area and in Sakhalin. In Hultén's opinion, subsp. *intercedens* is a more ancient form, growing nearer to the distribution center of the genus *Rhododendron*, China, than the two other subspecies. The latter diversified from this ancient form: one on the west coast of the Sea of Okhotsk, the other to the east of that sea, and both, in his opinion, migrated to America. The variety *pumilum* E. Busch is regarded by Hultén as an ecological form comprising his subsp. *typicum* and subsp. *glandulosum*. Hultén's arguments are not in full agreement with the labels which he attached in the herbarium and his indications of the distribution areas of the subspecies. All Hultén's labels with subsp. *glandulosum* concur with the var. *pumilum* labels of E. Busch.

Closer to reality are two markedly different varieties, as defined by E. Busch and, in a later study "Flora of the Kamchatka Peninsula" (Flora poluostrova Kamchatki) by V. L. Komarov. Busch distinguishes *Rh. kamtschaticum*, the typical variety and var. *pumilum* E. Busch, while in Komarov's work they are given as a. *Pallasianum* Kom. and b. *pumilum* Busch. Geographically, the two varieties are not clearly separated; var. *Pallasianum* occupies mostly the high-mountain thickets of *Pinus pumila*, alder, woods, and birch woods on morainic screes, the latter habitat being, according to Komarov's observations, most congenial for this plant; var. *pumilum* is associated with the balds of the alpine zone, moraines, friable products of volcanic eruptions, tundras, and rocks. The habitats point out clearly that var. *glandulosum* (var. *pumilum*) occurs under more severe climatic conditions than var. *Pallasianum*. The name var. *glandulosum* is not very suitable as both varieties are strongly glandular.

19. ***Rh. Redowskianum*** Maxim. in Mem. div. sav. Acad. Sc. Petersb. IX (1859) 189, in nota; in Mem. Acad. Sc. Petersb, VII ser. XVI, 9 (1870) 48; Kom. Fl. Man'chzh. III, 208; E. Busch in Fl. Sib. and Dal'n. Vost. II, 39; I. Kuzn. in Fl. Az. Ross. 9, 25; Hultén, Fl. Kamtch. IV, 17.— *Rh. viscosum* Fisch. ex Herd. in Tr. Bot. Sada, I (1872) 350, non Torr.— Ic.: Maxim. l.c. (1870) tab. II, f. 21-25; E. Busch, l.c. Fig. on page 40.

61 A densely branched deciduous shrub, 8-20 cm tall; branchlets grayish-brown, rough with scars of fallen leaves; leaves crowded at the ends of branchlets, coriaceous, oval, slightly attenuated toward base, terminating in an obtuse gland, 10-18 mm long, 2.5-7 mm broad at the middle, sparingly setose on the veins beneath, the slightly revolute margin obtusely toothed, the teeth ciliate; pedicels 2.5-5.5 cm long, densely glandular-pilose, 1-3-flowered, with 2 sessile oblong foliaceous glandular-ciliate

bracteoles; calyx 5-lobed, the lobes densely glandular-pilose, glandular-ciliate on the margin, oblong, 3-4.5 mm long, 1.5-2 mm broad; corolla ca. 1.5 cm in diameter, rotate-campanulate, purple, the lobes more than twice as long as the calyx, oblong-oval, 5-9 mm long, 3.6 mm broad, the tube 2-4 mm long; stamens 10, slightly unequal, the filaments villous at base; ovary villous; style slightly hairy at base, about half the length of the stamens, arcuate, reflexed after pollination; capsule ovoid, 3-6 mm long. Fl. July.

The mountain-tundra zone (on balds) of Transbaikalia mountains, Yablonovyi Range, Yakutia, and the Amur area. — E. Siberia: Lena-Kol., Far East: Ze.-Bu. Gen. distr.: Manchuria (Pei Shan Mountains). Described from the Stanovoi Range. Type in Leningrad.

Note. *Rh. Redowskianum* Maxim. differs from *Rh. kamtschaticum* Pall. in leaf shape and filament length. In *Rh. kamtschaticum* the 5 lower stamens are twice as long as the upper five, the style is slightly curved and exceeds the filaments, while in *Rh. Redowskianum* the stamens are slightly unequal, the style half as long as the filaments and strongly reflexed.

Genus 1093. **MENZIESIA*** J. F. SMITH. **

J. E. Smith, Pl. icon. ined. III (1791) tab. 56.

Calyx depressed, 4-5 lobed, persistent; corolla regular or slightly zygomorphic, subspherically or oblongly urceolate, the tube several times as long as the 4 or 5 lobes; stamens (5) 8-10, included in the corolla-tube or slightly exserted, the anthers linear, the pollen sacs opening by a small apical pore; style columnar with a flat stigma; fruit a 4-5-locular capsule, commonly thin-walled, septical; seeds numerous, linear, pointed or caudate; deciduous shrubs, vested with simple bristlelike hairs, these sometimes interspersed with glandular hairs; flowers in umbellate clusters arising from the terminal buds of the preceding year's shoots. Seven species, distributed through E. Asia and N. America.

1. *M. pentandra* Maxim. in Bull. Acad. Sc. Petersb. XI (1867) 432; in Mem. Acad. Sc. Petersb. VII ser. XVI, 9, 9; Fr. Schmidt, Fl. sachal. in Mem. Acad. Sc. Petersb. VII ser. XII, 157, 294; I. Kuzn. in Fl. Az. 62 Ross. 9, 29. — *M. ferruginea* var. *globularis* A. Gray in Mem. Acad. sc. a. arts, new ser. VI (1906) 399. — Ic.: C.K. Schn. Laubholz. II, Fig. 334, a-b, I. Kuzn. l. c. Fig. 10.

A shrub, 30-120 cm tall, the slender branches dichotomously 2- or 3-fold divided; young shoots covered with long glandular hairs; leaves crowded at the summit of shoots, 1.4-5 cm long, 0.5-2.3 cm broad, elliptic to oblong-elliptic, acute, short-petioled, entire, densely beset above and on the margin with setiform hairs, the vesture of the underside confined to isolated thickish bristles on the midrib; flowers (1) 2-5, arising from a terminal bud, on glandular drooping pedicels 1.2-2 cm long, in leafless umbels; calyx 5-toothed, rarely 4-toothed, the teeth short, rounded-triangular with strigose margin; corolla dull red, 6-7 mm long, globose-

* Named after Archibald Menzies (1754-1842), an Australian surgeon and naturalist.

** Prepared by A.I. Poyarkova.

urceolate, with 5 (4) spreading rounded lobes; stamens 5, the dilated glabrous filaments exserted; style shorter than the filaments, slightly curved; ovary densely setose; capsule borne on an erect stipe, globose-ovoid, sparingly setose, 4 mm long. Fl. June; fr. end of July.

Mountain woods and scrub. — Far East: Sakhalin and Kurile Is. **Gen. distr.:** Japan (Hokkaido and Honshu). Described from Hokkaido Is. Type (lectotype) in Leningrad.

Subfamily II. **PHYLLODOCEOIDEAE** (Drude) E. Busch comb. nov. — Tribus Phyllodoceae Drude in Engl. — Pr. Pflanzenf. IV, 1 (1897) 38. — Fruit a septicidal capsule; seeds globose, ovoid or cylindrical; corolla regular, campanulate, urceolate, or cupulate; anthers unappendaged.

Genus 1094. **LOISELEURIA** * DESV.

Desv. Journ. de Bot. I (1813) 35.

Calyx persistent, 5-parted; corolla campanulate, 5-lobed; stamens 5; anthers short, opening by a longitudinal slit; ovary 2-4-locular; capsule loculicidal; seeds globose, very small.

A monotypic arcto-alpine genus.

- 63 1. **L. procumbens** (L.) Desv. Journ. de Bot. I (1813) 35; DC. Prodr. VII, 2, 714; Ldb. Fl. Ross. II, 2, 918; E. Busch in Fl. Sib. and Dal'n. Vost. II, 41; Kom. Fl. Man'chzh. III, 214; Fl. Kamch. II, 362; Fedch. and Fler. Evrop. Rossii, 723; Hulten, Fl. Kamtch. IV, 17; Kryl. Fl. Zap. Sib. IX. 2109. — *Azalea procumbens* L. Sp. pl. (1753) 151 Pall. Fl. Ross. I, 2, 52. — *Chamaeledon procumbens* Link, Enum. pl. hort. berol. I (1821) 211. — *Rhododendron procumbens* Wood, Classb. (1845) 236. — *Chamaecistus procumbens* Kuntze, Rev. gen. II (1891) 388. — Ic.: Pall. Fl. Ross. I, 2, tab. 70, f. 2, A, B, C; Drude in Engl. — Pr. Pflanzenf. IV, 1 (1897) f. 27, A, B, C; Fedch. and Fler. Fl. Evrop. Rossii (1910) Fig. 600; E. Busch, l.c. Fig. on page 43.

A low evergreen strongly depressed shrub; leaves opposite, closely approximate, elliptic to oblong-elliptic, 3-8 mm long, 1-2.5 mm broad at the middle, coriaceous, revolute, entire, dark green and lustrous above, the midrib very broad, the petioles 1-2.5 mm long, slightly divergent; flowers 2-5 in an umbellate cluster at the end of branchlets; pedicels reddish, 3-5 mm long in flower, elongating to 8-10 mm in fruit, arising from the axils of ovate pubescent-margined bud scales; calyx reddish, 5-parted, the pointed lobes 1.5-2 mm long, 0.5-0.7 mm broad at the middle; corolla campanulate, pink or white, the lobes acutish; stamens shorter than corolla, the filaments thick, flattish; stigma capitate; capsule globose, 3-4.5 mm long. Fl. June-August; ripe fr. August-September.

Stony lichen or bush tundra and balds, on grassless ground. — Arctic: Arc. Eur. Nov. Z., Arc. Sib., Chuk., An.; European part: Kar.-Lap., U. Dns. (Carpathians); E. Siberia: Lena-Kol., Ang.-Say., Dau.; Far. East: Kamch., Okh., Ze.-Bu., Uda, Sakh. (Sakhalin and Kurile Is.). **Gen. distr.:** Greenland, Scand., Atl. Eur. (mountains), Centr. Eur.

* Named after the French botanist J. C. A. Loiseleur-Deslongchamps (1744-1849).

(Carpathians, Banat, Alps), Mong., Jap., N. Am. (from Alaska to Labrador, in mountains southern limit 54°N.). Described from Scandinavia. Type in London.

Genus 1095. **PHYLLODOCE** * SALISB.

Salisb, in W. Hook. Parad. Lond. (1806) tab. 36.

Calyx persistent, 5-parted; corolla ovoid-urceolate, 5-toothed, deciduous; stamens 10; anthers oblong, the divergent thecae opening by an oblique lateral downward-pointed slit; capsule ovaloid, 5-locular, loculicidal; seeds ovaloid, lustrous.

A monotypic arcto-alpine genus.

1. Flowers rosy-bluish, 2-6 at the ends of shoots 1. **Ph. coerulea** (L.) Bab.
64 + Flowers greenish-white, 6-15 and the ends of shoots 2. **Ph. aleutica** (Spreng.) A. Heller.

1. **Ph. coerulea** (L.) Bab. Man. brit. Bot. ed. 1 (1843) 194; B. Fedtsch. Fl. il. Command. 86; Small in N. Amer. Fl. 29, 1 (1914) 50; E. Busch in Fl. Sib. and Dal'n. Vost. II (1915) 46; Kom. Fl. Kamch. II, 363; Hulten, Fl. Kamtch. IV, 23; Kryl. Fl. Zap. Sib. IX, 2110.—*Andromeda coerulea* L. Sp. pl. (1753) 393; Pall. Reise, III, 306; Fl. ross. I, 2, sub tab. 72, f. 2.—*A. taxifolia* Pall. Fl. Ross, I, 2 (1788) 54.—*Erica coerulea* Willd. Sp. pl. II (1799) 393.—*Phyllodoce taxifolia* Salisb. Parad. Lond. I (1806) tab. 36; Ldb. Fl. Ross. II, 2, 916; Fedch. i Fler. Fl. Evrop. Rossii (1910) 723.—*Menziesia coerulea* Swartz in Trans. Linn. Soc. Lond. X (1811) 377; Wahlenb. Fl. Lapp. 105.—*Bryanthus taxifolius* Gray in Proc. Am. Acad. Sc. Arts, VII (1868) 368; Fl. N. America, II, 1, 37.—*Phyllodoce taxifolia* α . *genuina* Herder in Tr. Bot. Sada, I (1872) 336.—*Bryanthus coeruleus* Dippel, Handb. Laubholz. I (1889) 385.—Ic.: Pall. Fl. Ross. I, 2, (1784) tab. 72, fig. 2; Rchb. Icon. XVII, tab. 1160, f. 3-12; Drude in Engl.—Pr. Pflanzenf. IV, 1 (1897) 39, f. 26, A, B.; Fedch. and Fler. l.c., Fig. 601; E. Busch, l.c. 47.—Exs.: Pl. Finland. exs. Nos. 843, 844.

A low evergreen shrub, 8-35 cm tall, the erect crowded slender branches very leafy; leaves alternate, linear, obtuse, 5-14 mm long, 1-2 mm broad, slightly serrulate, with a prominent midrib, the petiole 0.5 mm long. Flowers 2-6 in a terminal cluster; pedicels 11-28 mm long in flower, elongating in fruit to 20-38 mm, reddish, hairy-glandular, arising from the axils of oval bud-scales; calyx red, 5-parted, glandular-pilose; sepals lanceolate, 3.5-4 mm long, 1-1.25 mm broad at the middle, 1/3-1/2 the length of corolla; corolla ovoid-urceolate, 5-toothed, rosy-bluish, sparsely glandular-hairy on the margin, 8-10 mm long, 4-6 mm broad; stamens 10, the anthers linear, 1-1.25 mm long, the filaments flattened, smooth or rarely covered with short hairs; capsule globose, 3-4 mm long. Fl. August; fr. August.

Subalpine scrub, rock and stone tundra, balds, grassless soil.—Arctic: Arc. Eur., Chuk.; European part: Kar.-Lap., Urals; E. Siberia: Ang.-Say., Dau., Lena-Kol., Far East: Ze.-Bu., Sakh. (Sakhalin and Kurile Is.),

* From Greek: *phylon* = leaf, and *dokeo* = to appear, referring to the leaves which resemble those of the genus *Erica*.

Kamch. **Gen. distr.:** N. Scand., Atl. Eur. (Scotland), Pyrenees, N. Mong., mountains of Korea and Japan, Greenland, Arc. N. Am. (Labrador, mountains of Maine, and of New Hampshire and Quebec). Described from Scandinavia. Type in London.

2. **Ph. aleutica** (Spreng.) A. Heller in *Mühlenbergia*, I, 1 (1900) 1; Makino in *Bot. Mag. Tokyo*, 134; Small in *N. Amer. Fl.* 29, 1, 51; E. Busch in *Fl. Sib. and Dal'n. Vost.* II, 48; Kom. *Fl. Kamch.* II, 365.— *Menziesia aleutica* Spreng. *Syst. veg.* II (1825) 202.— *Phyllodoce Pallasiana* D. Don in *Edinb. new. phil. Journ.* XVII (1834) 159; DC. *Prodr.* VII, 2, 713; Ldb. *Fl. Ross.* II, 2, 917.— *Bryanthus aleuticus* A. Gray in *Proc. Am. Acad.* 7 (1867) 368.

An evergreen shrub, 11-40 cm tall, very densely leafy; leaves alternate, pale green, linear, obtuse, 5-14 mm long, 1-2 mm broad, glandular-serrulate, the midrib not reaching the apex and on the upper side densely white-pilose, the petiole 0.5-1 mm long; flowers 5-15 in terminal clusters; pedicels 10-19 mm long in flower, elongating in fruit to 20-25 mm, greenish-yellow, glandular-villous, arising from the axils of oval bud scales; calyx 5-parted, villous-glandular, yellowish-green, sometimes turning rose, 4-5 mm long, 1.5-2 mm broad, 2/3 as long as corolla; corolla ovoid-urceolate, 5-lobed, greenish-white, sometimes fading to slightly pink, glandular-pilose on the outside, 6-7 mm long; stamens 10; anthers 1-1.5 mm long; capsule globose, 3-3.5 mm long. Fl. July-August; fr. September.

Rocky slopes, heath tundras, and balds.— Far East: Sakh. (Sakhalin and Kurile Is.), Kamch. (Komandorskie Is., Medvezhii Is.). **Gen. distr.:** Japan (Hokkaido), Ber. (Aleutian Is.), N. Am. (from Alaska and the Yukon to Oregon and Montana). Described from the Aleutian Islands. Type in Berlin.

Note. The species *Ph. coerulea* and *Ph. aleutica* differ strikingly and their combining in a single species by I. Kuznetsov in "The Flora of Asiatic Russia" (*Flora Aziatskoi Rossii*) (No. 9, 1916) is unwarranted. Each of the species has a distinct distribution area. A striking distinguishing character is leaf coloration: the leaves of *Ph. coerulea* are dark green, those of *Ph. aleutica* are greenish-yellow and densely covered with hairs on the midrib. Fading specimens have been classified by Hulten as *Ph. aleutica* × *coerulea*; the color of the corolla and calyx is faint pink, possibly due to the presence of a small amount of anthocyanin associated with fading. A similar phenomenon is associated with the fading of a large number of high-mountain plants of the Caucasus and is characteristic of *Rhododendron caucasicum* Pall. among others.

Genus 1096. **BRYANTHUS*** STELL.

Stell. ex Pall. *Fl. Ross.* I, 2 (1788) 58.

Calyx persistent, 4- or 5-parted; corolla dissected nearly down to base into 4 or rarely 5 lobes; stamens twice the number of corolla lobes; anthers short, opening by an oblique apical pore; capsule depressed-globose, 4-angled, loculicidal; seeds numerous, ovoid, lustrous, carinate by the suture.

* From Greek *bryon* = moss, and *anthos* = flower, alluding to the mosslike appearance of this plant.

A monotypic genus with a very restricted distribution area.

1. **B. Gmelini** D. Don in Edinb. new phil. Journ. XVII (1834) 160; DC. Prodr. VII, 2, 712; Ldb. Fl. Ross. II, 2, 15; E. Busch in Fl. Sib. i Dal'n. Vost. II, 50; Kom. Fl. Kamch. II, 365; Hulten, Fl. Kamtch. IV, 24. — *Andromeda bryantha* L. Mant. II (1771) 238. — *Erica bryantha* Thunb. Diss. de *Erica* (1785) 15. — *Andromeda Bryanthus* Pall. Fl. Ross. I, 2 (1788) 57. — *Menziesia Bryanthus* Swartz in Trans. Linn. Soc. X (1811) 377. — *Bryanthus "musciiformis"* Nakai, Trees a. shrubs, Jap. ed. 1, I (1922) 16 (cum auct. Poir.). — Ic.: Pall. l.c. tab. 74, f. 1; Swartz, l.c. tab. 30, fig. B; E. Busch, l.c. Fig. on page 51.

A low evergreen depressed shrub, with puberulent young branchlets; leaves spiral, linear-oblong, acutish, 2.5-3 mm long, 1 mm broad, thickly coriaceous, glandular-ciliate, with a concave midrib beneath, smooth above, lustrous on both sides, the petiole 0.3-0.5 mm long; fertile shoots at the ends of the preceding year's branches, elongated, hairy-glandular, erect, 4-5 cm long, with 2-8 glandular-ciliate scattered leaves, terminating in a 2-10-flowered cluster; pedicels 5-6 mm long in flower, elongating in fruit to 8-9 mm, covered with short white hairs; calyx 4-5-parted, the lobes 0.75-1 mm long; corolla dissected to below the middle into 4-5 lobes, pink, spreading, the lobes 6-7.5 mm long; stamens 8-10, twice the number of calyx-lobes, the filaments flat, glabrous; style straight, short, the stigma obtuse; capsule 2 mm long. Fl. July-August; fr. August.

In thickets of *Pinus pumila* woods, on mossy hillocks, in stone and lichen tundra. — Far East: Kamch. (S. and Centr. parts of Komandorskie Is.). **Gen. distr.:** Japan. Described from Kamchatka. Type in Leningrad.

Subfamily III. **ANDROMEDEDOIDEAE** (Drude) E. Busch comb. n. — Tribus *Andromedaeae* Drude in Engl. — Pr. Pflanzenf. IV, 1 (1897) 40. — Fruit a depressed-globose 4- or 5-valved capsule, the septa attached at the middle of the valve; corolla caducous, 4- or 5-parted, cupulate or campanulate; anthers appendaged.

Genus 1097. **CASSIOPE** * D. DON

D. Don in Edinb. new phil. Journ. XVII (1834) 157.

67 Calyx persistent, deeply 4- or 5-parted; pedicels lateral; corolla campanulate, 4- or 5-parted; stamens twice the number of corolla lobes; anthers short, the inflated thecae with recurved aristate appendages, opening by a large apical pore; style subcylindric, straight; capsule globose to ovoid, 4- or 5-locular, loculicidally 4- or 5-valved; seeds numerous, oblong, lustrous. The genus *Cassiope* is characterized by sessile appressed leaves, whose underside, lateral pedicels, and subcolumnar style face outward.

The genus contains 7 species.

* Named after *Cassiope*, mother of *Andromeda* in Greek mythology.

1. Leaves deeply furrowed on the back 2.
- + Leaves not furrowed on the back 3.
2. Leaves bristly-ciliate along the entire margin. 4. **C. ericoides** (Pall.) D. Don.
- + Leaves softly ciliate on the margin and along the edges of the furrow. 3. **C. tetragona** (L.) D. Don.
3. Leaves dull, ovate, appressed, scarious-margined 1. **C. lycopodioides** (Pall.) D. Don.
- + Leaves lustrous, broadly oval-elliptic, brown ciliate on the margin, terminally clustered... 2. **C. Redowskii** (Cham. et Schlechtd.) G. Don.

Series 1. **Esulcatae** E. Busch.—Leaves not furrowed on the lower side.

1. **C. lycopodioides** (Pall.) D. Don in Edinb. new phil. Journ. XVII (1834) 158; DC. Prodr. VII, 2, 610; Ldb. Fl. Ross. II, 2, 912; E. Busch. in Fl. Sib. i Dal'n. Vost. II, 54; Kom. Fl. Kamch. III, 6; Hulten, Fl. Kamtch. IV, 27.—*Andromeda lycopodioides* Pall. Fl. Ross. I, 2 (1788) 58.—*Erica lycopodioides* Waitz, Besch. Gatt. Art. Heid. (1805) 156.—Ic.: Pall. Fl. Ross. I, 2, tab. 73, f. 1; Cov. in Proc. Wash. Acad. Sc. 3, 574, f. 65, a, b, c, d, e, f; E. Busch, l.c. 55.

A low depressed evergreen shrub with long slender branches; leaves sessile, opposite, 2 mm long, 0.75-1.5 mm broad, entire, scarious-margined, at first bearded above; pedicels glabrous, lateral, axillary, surrounded at base by membranous bud scales, 14-30 mm long in flower, elongating in fruit to 17-34 mm; sepals 2 mm long, 1.5 mm broad; corolla campanulate, white, 5-lobed, 6-8 mm long; stamens 10, the filaments flattish, glabrous; style columnar, straight, obtuse; capsule subglobose, 2.5-3 mm long. Fl. June-August; fr. August-September.

68 Stony and gravelly soils, volcanic sand, rocks, taluses; in lichen, hilly and heath tundras, and on stony slopes.—Arctic: Chuk.; Far East: Kamch., Sakh. (S. Sakhalin and Kurile Is.), Okh. **Gen. distr.:** Japan, Ber. (Aleutian Is.), Alaska. Described from Kamchatka. Type in London.

2. **C. Redowskii** (Cham. et Schlechtd.) G. Don, Gen. Syst. III (1834) 829; DC. Prodr. VII, 2, 611; Ldb. Fl. Ross. II, 2, 912; Kom. Fl. Man'chzh. III, 213; E. Busch. in Fl. Sib. i Dal'n. Vost. II, 56; Hulten, Fl. Kamtch. IV, 29.—*Andromeda Redowskii* Cham. et Schlechtd. in Linnaea, I (1826) 517.—Ic.: E. Busch. l.c. 57.

A very small depressed evergreen shrub with numerous ascending branches, 17-25 cm tall; leaves sessile, scalelike, broadly oval-elliptic, opposite, very tightly appressed to the stem, 2-3 mm long, 1-1.5 mm broad, lustrous, glabrous, hyaline and brown-ciliate on the margin, the fringe tasseled at first, at length falling; pedicels glabrous, lateral, axillary, surrounded at base by membranous bud scales in the axils of outer leaves, declined in flower and 3-7 mm long (hence flowers nodding), elongating to 6-9 mm and becoming erect in fruit; calyx deeply 4-parted, the lobes 1.5-2 mm long, coriaceous, hyaline-margined at the tip; corolla white, campanulate, obtusely 4-lobed, 4-6 mm long; stamens 8, the filaments thickish; pistil longer than the stamens; style straight, obtuse; capsule subglobose, 3 mm long. Fl. July-August; fr. September.

Mountains, in *Pinus pumila* sphagnum scrub, fir and spruce woods, elevated rocky ledges, basaltic tableland, and in mountain tundra on balds.— Far East: Ze.-Bu., Uss., Okh. **Gen. distr.:** Aleutian Is. (Unalaska). Described from the Okhotsk area. Type in Leningrad.

Series 2. **Sulcatae** E. Busch.— Leaves with a furrow on the lower side.

3. **C. tetragona** (L.). D. Don in Edinb. new phil. Journ. XVII (1834) 158; DC. Prodr. VII, 2, 611; Ldb. Fl. Ross. II, 2, 912; Small in N. Amer. Fl. 29, 1, 59; E. Busch. in Fl. Sib. i Dal'n. Vost. II, 58; Kom. Fl. Kamch. III, 7; Hulten, Fl. Kamtch. IV, 29; Kryl. Fl. Zap. Sib. IX, 2111.— *Andromeda tetragona* L. Sp. pl. (1753) 393; Pall. Fl. Ross. I, 2, 61.— *A. columellaris* Fisch. ex Trautv. in Tr. Bot. Sada, VIII, 2 (1883) 570, nom nud.— Ic.: Pall. l.c. tab. 73, f. 4; Drude in Engl.— Pr. Pflanzenf. IV, 1, 22, f. 12, D, E; Cov. in Proc. Wash. Acad. Sc. 3, 572, f. 64; Fedch. i Fler. Fl. Evrop. Rossii, Fig. 603; E. Busch, l.c. 59.— Exs.: Pl. Finland. exs. No. 846.

69 A decumbent evergreen shrub with ascending branches, 8-30 cm tall; leaves sessile, dull above, imbricated, oval-trigonus, obtuse, deeply channeled beneath by revolute margins, puberulent and ciliolate on the margin, 2-5.5 mm long; pedicels glabrate, surrounded at base by membranous axillary and concealed leaf buds, declined and 10-14 mm long, in flower, becoming erect and 14-24 mm long in fruit; calyx deeply 5-parted, 1-1.5 mm wide; corolla yellowish, campanulate, 6-8 mm long; stamens 10, half the length of corolla; the filaments slightly thickened at base; pistil longer than the stamens; style columnar, straight, obtuse; capsule subglobose, 3-5 mm long. Fl. June-July; fr. September.

Above the timberline, in gravelly or sandy soil, in dry sandy places, in *Pinus pumila* thickets, in scrub and lichen tundra, on balds, and on riverside pebbles.— Arctic: Arc. Eur., Arc. Sib., Chuk., An.; European part: Kar.-Lap., Dv.-Pech. (Arctic Urals)— E. Siberia: Lena-Kol., Dau.; Far East: Ze.-Bu., Kamch. **Gen. distr.:** Arc., Scand., Ber., N. Am. (Arc. and N., from Alaska to Labrador). Described from Scandinavia. Type in London.

Note. Flowers with a pleasant though weak scent resembling that of *Convallaria majalis* L., the fragrance becoming more intense in the evening. A species introduced into cultivation as a decorative plant.

4. **C. ericoides** (Pall.) D. Don in Edinb. new phil. Journ. XVII (1834) 158; DC. Prodr. VII, 2, 611; Ldb. Fl. Ross. II, 2, 913; Kom. Fl. Man'chzh. 213; E. Buschin Fl. Sib. i Dal'n. Vost. II, 61; Hulten, Fl. Kamtsch. IV, 27.— *Andromeda ericoides* Pall. Fl. Ross. I, 2 (1788) 56.— Ic.: Pall. l.c. tab. 73, f. 3; E. Busch, l.c. 62.— Exs.: GRF, No. 3094.

An evergreen shrub with numerous flexuous branches, 8-30 cm tall; leaves sessile, lustrous, imbricated, oblong, subtetragonous, obtuse, 3-4 mm long, 0.5-0.75 mm broad, the margin covered with long setiform ferruginous cilia; pedicels glabrous, surrounded at base by axillary membranous bud scales, 3-5 mm long in flower, elongating in fruit to 6-9 mm; calyx deeply 4-parted, the lobes 1.5-2 mm long, 0.5-0.75 mm broad; corolla white, globose-campanulate, 4-lobed; stamens 8, the

filaments slightly thickened at base; pistil longer than the stamens; style cylindric, obtuse; capsule ovaloid, 2-2.5 mm long. Fl. June-August; fr. August.

70

Deciduous woods, in thickets of *Pinus pumila* woods, in dry peaty soil, on stony screes and rocks, and on balds.—Arctic: An.; E. Siberia: Lena-Kol., Dau.; Far East: Ze.-Bu., Uss., Uda, Okh. Endemic. Described from Dauria. Type in London.

Genus 1098. **HARRIMANELLA*** COV.

Cov. in Proc. Wash. Acad. Sc. 3 (1901) 570.

Calyx persistent; deeply 5-parted; pedicels terminal, solitary, 1-flowered; corolla campanulate, 5-parted; stamens 10, the anthers short, with inflated thecae and awnlike apical appendages; style terminal, much thickened at base; capsule globose, 5-lobed, loculicidal; seeds numerous, oblong.

The genus *Harrimanella* contains only two species with widely separated distribution areas.

1. Leaves subappressed, densely covering the stem, acicular, acute.
..... 1. *H. hypnoides* (L.) Cov.
- + Leaves more scattered, spreading, often at a right angle, oblong, obtusish 2. *H. Stelleriana* (Pall.) Cov.

1. *H. hypnoides* (L.) Cov. in Proc. Wash. Acad. Sc. 3 (1901) 575; Small in N. Amer. Fl. 29, 1, 60; I. Kuzn. in Fl. Az. Ross. 9, 44; Kom. Fl. Kamch. III, 8.—*Andromeda hypnoides* L. Sp. pl. (1753) 393; Pall. Fl. Ross. I, 2 (1788) 55.—*Cassiope hypnoides* D. Don in Edinb. new phil. Journ. XVII (1834) 158; G. Don, Gen. Syst. III, 829; Ldb. Fl. Ross. II, 2, 913; E. Buschin Fl. Sib. i Dal'n. Vost. II, 64; Kryl. Fl. Zap. Sib. IX, 2111.—*Cassiopeia hypnoides* Hook. Outl. (1862) 296.—Ic.: Pall. l.c. tab. 73, f. 2; G. Don, l.c.f. 136; Drude in Engl.—Pr. Pflanzenf. IV, 1, 22, f. 12, J; Cov. in Proc. Wash. Acad. Sc. 3 (1901) 576, f. 66; Fedch. i Fler. Fl. Evrop. Rossii, Fig. 602; E. Busch, l.c. 65.

A minute decumbent evergreen shrub, the ascending branches up to 3-7 cm long; leaves oblong, subulate, crowded, subappressed, serrulate, 2-4 mm long, 0.5 mm broad; pedicels solitary, terminal, glabrous or puberulent, surrounded at base by minute scales, declined in flower, 6-11 mm long, becoming erect and 13-17 mm long in fruit; calyx deeply 5-parted, the lobes up to 2 mm long and 0.75-1 mm broad; corolla white, campanulate, 5-lobed, 4-5 mm long, sometimes purple-tinged; filaments verrucose; style minute, terminal, strongly thickened at base; capsule globose, flattened at the top, 2.5-3.5 mm long. Fl. June-July; fr. July-September.

71

Scrub, stony banks of rivers and mountain streams, patchy and stony tundra, and mountain peaks, on grassless sites.—Arctic: Arc. Eur., Nov. Z., Arctic Urals. **Gen. distr.:** Arc. (Scand., Iceland, Spitsbergen, Greenland). Described from Scandinavia. Type in London.

* Named after H. Harriman, who participated in the Alaska expedition of 1899.

2. *H. Stelleriana* (Pall.) Cov. in Proc. Wash. Acad. Sc. 3 (1901) 574; Small in N. Amer. Fl. 29, 1, 60; Kom. Fl. Kamch. III, 8.—*Andromeda Stelleriana* Pall. Fl. Ross. I, 2 (1788) 58.—*Erica Stelleriana* Willd. Sp. pl. II (1799) 387.—*Cassiope Stelleriana* DC. Prodr. VII, 2 (1839) 611; Ldb. Fl. Ross. II, 2, 913, E. Busch in Fl. Sib. i Dal'n. Vost. II, 66, Hulten, Fl. Kamtch. IV, 29.—Ic.: Pall. Fl. Ross. II, tab. 72, f. 2; Hook. Fl. bor.-am. II, tab. 131; Cov. in Proc. Wash. Acad. Sc. 3, 570, f. 62; E. Busch, l. c. 66.

A small decumbent evergreen shrub, with slender, densely leafy ascending branches 5-7 cm long; leaves oblong, obtuse or acutish, divergent, sometimes subhorizontally spreading, flat above, with a faint midrib beneath, slightly narrowed toward base, 2.5-3 mm long, 0.75-1 mm broad, obscurely petiolate, the petiole not exceeding 0.25-0.5 mm; pedicels terminal, faintly puberulent in flower, very short and almost imperceptible, elongating in fruit to 2-4 mm and becoming glabrate; calyx with 5, rarely 4 distinct red light-margined lobes, 2.5-3 mm long and 1.5-2 mm broad; corolla pale rose, campanulate, wide open, deeply 5- or sometimes 4-lobed, 5-6 mm long; stamens 10 or 8, twice the number of corolla lobes; style minute, terminal, strongly thickened at base; capsule subglobose, 4-6 mm long. Fl. July-August; fr. August-September.

Stony meadows in the alpine zone, meadow-lichen tundra, and volcanic deposits, sometimes in pure stands.—Far East: Sakh. (Kurile Is.), Kamch. **Gen. distr.:** Japan (mountains), Ber. (Aleutian Is.), N. Am. (Alaska, Sitka, and the mountains of British Columbia and Washington State). Described from Bering Island. Type in London.

Genus 1099. **ARCTERICA** * COV.

Cov. in Proc. Wash. Acad. Sc. 3 (1901) 573.

Calyx persistent, deeply 5-parted; corolla urceolate, 5-lobed; stamens 10, the anthers short, the oblong-ovaloid thecae awned, basifixed, opening by apical pores; seeds numerous, smooth.

A very distinct ancient monotypic genus.

- 72 1. *A. nana* (Maxim.) Makino in Bot. Mag. Tokyo, 20 (1906) 85; E. Busch in Fl. Sib. i Dal'n. Vost. II, 69; Hulten, Fl. Kamtch. IV, 31.—*Andromeda nana* Maxim. in Nel. biol. 8 (1872) 615; in Bull. Acad. Sc. Petersb. XVIII, 47.—*Cassiope oxycoccoides* A. Gray in Proc. Amer. Acad. 20 (1885) 300.—*Pieris nana* Makino in Bot. Mag. Tokyo, 8 (1894) 213.—*ArctERICA oxycoccoides* Cov. in Proc. Wash. Acad. Sc. 3 (1901) 573; Kom. Fl. Kamch. III, 5.—*Lyonia nana* Makino, l. c.—Ic.: Cov. in Bot. Gaz. 37 (1904) 300, 301, f. 1, 2a; Drude in Engl.—Pr. Nachtr. III zu IV, 1 (1908) 266, f. 37, A, B, C, D, E; E. Busch, l. c. 68, Fig. 3, 4, 69, 70.—

A dwarf decumbent evergreen shrub, vested with appressed gray pubescence, the short branches densely clothed in leaves; leaves in whorls of 3, elliptic, obtusely glandular-tipped, coriaceous, entire, revolute, the upper side with a concave midrib, dull, puberulent throughout, the lower side with a sparingly glandular-pilose convex midrib and faint or

* From Greek *arktos* = north or bear, and the generic name *Erica*.

sometimes almost imperceptible lateral veins, 4-8 mm long, 2.5-4 mm broad, the petiole 0.5-1 mm long; clusters 3-7-flowered, terminal, subtended by 2 bracts, each pedicel bearing 2 bracteoles about its middle; pedicels covered with curly hairs; bracts and bracteoles oval, pointed, ciliate-margined, caducous; calyx deeply 5-parted, with acute ciliate-margined lobes, 2.5 mm long, 0.75-1 mm broad; corolla pale rose, urceolate, 4-5 mm long; filaments somewhat enlarged at base, glabrous; style thick, cylindric; capsule subglobose, 3.5-4 mm long. Fl. June-July; fr, September.

Alpine zone, moss and lichen stony tundra, dry tableland, and rocks. — Far East: Sakhal., Kamch. **Gen. distr.:** Japan (Hokkaido and Honshu Is.). Described from Japan. Type in Leningrad.

Note. In general appearance this species looks very much like a small-leaved *Vaccinium vitis-idaea* L. According to the report of M.N. Karavaev, collected by V. Uspenskii in Arctic Siberia (in the Lena Estuary).

Genus 1100. **EUBOTRYOIDES** * (NAKAI) HARA **

Hara in Journ. Jap. Bot. XI (1935) 621. — *Leucothoë* sect. *Eubotryoides* Nakai, Trees a. shrubs. Japan, I (1922) 127.

Calyx persistent, parted nearly to base 5 narrow lobes, valvate in bud; corolla globose to ovoid-globose, the tube 1 1/2-2 1/2 times as long as the 5 triangular lobes; stamens 10, included in the tube, adhering to base of corolla, the filaments dilated at base, the anthers ovoid-ellipsoid, the thecae unappendaged, opening by a large angular-edged apical pore; ovary 5-lobed, 5-locular; style columnar, with a truncate stigma; capsule, strongly flattened, thin-walled, 5-celled, loculicidal, the ovules attached at the top of the columella; seeds numerous, small, lenticular, with an irregular narrow membranous border. Erect deciduous, shrubs. Flowers in a long many-flowered cluster at the end of axillary shoots.

Two species from Japan: *E. Tshonoskii* (Maxim.) Pojark. comb. n. and *E. Grayana* (Maxim.) Hara, the latter penetrating into the USSR.

1. ***E. Grayana*** (Maxim.) Hara in Journ. Jap. Bot. XI (1935) 621. — *Leucothoë chlorantha* A. Gray in Mem. Acad. arts a. sc. new ser. VI (1856) 399, non DC. — *L. Grayana* Maxim. in Mel. biol. VIII (1872) 613; in Bull. Acad. Sc. Petersb. XVIII (1873) 46; Miyabe, Fl. Kuril. 247; Kudo in Jap. Journ. Bot. II, 272; Vorob'ev in Tr. Dal'nevost. bazy AN SSSR, gen. ser. I, 37. — *L. Grayana* var. *Maximowicziana* Takeda in Kew Bull. (1912) 221. — *Gautiera jezoensis* Sieb. apud Maxim. in sched. nom. nud. — *Leuc. Grayana* var. *typica* Boissieu in Bull. Herb. Boiss. V (1897) 911. — *L. Grayana* var. *intermedia* Boissieu, l. c.; Sugawara, III. Fl. of Saghal. IV, 1491. — Ic.: Sugawara, l. c. tab. 682.

An erect dichotomously branched shrub; shoots of the current year ocher-yellow, smooth, lustrous; old branches light gray with longitudinally splitting bark; leaves subsessile, mostly elliptic, more rarely ovate or oblong, obtuse or acute, somewhat notched or rounded rarely cuneate at base, 2.3-9.5 cm long, 0.8-6 cm broad, the upper surface glabrous, the

* Alluding to resemblance to the genus *Eubotrys*, the name of which is derived from Greek *eu* = true, and *botrys* = cluster.

** Prepared by A.I. Poyarkova.

74 lower surface prominently reticulate with a setose midrib, the margin beset with setiform cilia; clusters 6-12 cm long, 10-20-flowered in the axils of upper leaves, or sometimes solitary flowers in all the leaf axils; the subtending leaves linear-oblong, slightly longer than the pedicels; pedicels 3-6 mm long, nodding in flower, becoming erect in fruit, bearing 2 narrow linear often subcapillary bracteoles; sepals ovate-lanceolate to oblong-lanceolate, acute, with glandular-dentate or entire margin, 2.5-3 mm long; corolla 4.5-6 mm long, globose, the lobes about half as long as the tube, triangular, acute, spreading in upper part, the lobes and the upper part of the tube hairy; stamens slightly more than half the length of corolla, the filaments beset with stiff long hairs, curved toward the pistil in upper part, dilated at base; anthers ellipsoid or globose; ovary glabrous or hairy; style slightly shorter than corolla; capsule 4-5 mm in diameter, 4-furrowed, strongly depressed, glabrous or hairy. Fl. June-July; fr. August (Plate III, Figure 3).

Mountain slopes up to the alpine zone. — Far East: Sakh. **Gen. distr.:** Japan (Hokkaido, Honshu, and Shikoku Is.). Described from Hokkaido (Yezo). Type in Leningrad.

Note. The inflorescence contains a toxic substance grayanotoxin, $C_9H_{14}O_3$.

Genus 1101. **ANDROMEDA** * L.

L. Sp. pl. (1753) 393, p. p. quoad sp. No. 3.

Calyx persistent, 5-parted; corolla ovoid-urceolate, 5-lobed; stamens 10, included in the corolla, each locule of the anther attached to filament by its middle part and elongated into a curved subulate awn, opening by large pores at the base of awn; capsule subglobose, 5-loculed, loculicidally 5-valved; seeds ovaloid, lustrous.

A monotypic genus, distributed through the north temperate and Arctic zones of both hemispheres.

Species of *Andromeda* are recorded from the Eocene to the Quaternary period.

Andromeda polifolia L. in early Quaternary layers of L. V. (town of Serov) — *A. kuschkinsis* Vasil. in the Eocene of Mtn. Turkm. (Badkhyz: Mt. Monakh). — *A. protogaea* Ung. in the Eocene of U. Dnp. (Yablonsky, Rudnya Baraniv'ska, Volyanshchina, Mogil'no) and M. D. (Ekaterinopol', Arsen'ev); in the Oligocene (Poltava stage) of V. -Don (Tim, Molotychi); in the Paleocene of Bl. (Sukhie Yaly, Kremennaya ravine); in Mediterranean (Kemah) and Chokrak-Spirialis layers of Dagestan (Khaivag-dere); in Tertiary layers of W. Transc. (Goderzi); in Eocene layers of U. Tob. (S. Urals, Baki); — *A. revoluta* A. Br. in the Eocene layers of U. Dnp. (Volyanshchina, Rudnya Baraniv'ska, Karpovy Nivki) — *A. Saportana* in the Eocene of U. Dnp. (Volyanshchina, Ryzhany) and M. D. (Ekaterinopol'); in the Oligocene (Poltava stage) of V. -Don. (Molotychi) — *A. cf. tremula* Heer in the Oligocene layers of Sakh. (Evai River).

1. ***A. polifolia*** L. Sp. pl. (1753) 393; Pall. Fl. Ross. I, 2, 53; Ldb. Fl. Ross. II, 2, 910. — Small in N. Amer. Fl. 29, 1, 61; E. Busch in Fl. Sib. i Dal'n. Vost. II, 72; Kom. Fl. Kamch. III, 4; Hulten, Fl. Kamtch. IV, 30; Kryl. Fl. Zap. Sib. IX, 2112. — *A. rosmarinifolia* Gilib. Fl. lithuan. I (1781) 3. — *A. grandiflora* hort. ex Steud. Nomencl. bot. ed. 2, I (1840) 88, p.p. — *Polifolia montana* Nakai, Trees a. shrubs Jap. 1 (1922) 55. — Ic.: Drude in Engl. — Pr. Pflanzenf. IV (1897), f. 28,

* Named after Andromeda of Greek mythology.

L-O; Fedch. i Fler. Fl. Evrop. Rossii, Fig. 604; Maevsk. Fl. Sr. Ross. (1940), Fig. 232; E. Busch, l.c. 73, 75.— Exs.: GRF, No. 776; Pl. Finland. exs. No. 316; Fl. pol. exs. No. 546.

75

An evergreen shrub with ascending branches, 30-40 cm tall (3-10 cm — var. *pusilla* Pall.); leaves coriaceous, oblong-oval or oblong-linear or narrowly linear, acuminate, 9-26 mm long, 0.75-8 mm broad, revolute, the upper side green lustrous with concave midrib, the lower side glaucous-whitish with a waxy bloom, the petiole 1-1.5 mm long; flowers nodding, long-pedicelated, gathered in 2-6-flowered clusters at the ends of the preceding year's shoots; pedicels surrounded at base by bud scales, 7-15 mm long in flower, elongating in fruit to 10-20 mm; calyx minute, red, the sepals 1-1.5 mm long and 0.75-1 mm broad; corolla pink, ovoid-urceolate, 5-6 mm long, pubescent within; filaments bearded, dilated at base, the anthers dark red; style slightly shorter than corolla; capsule subglobose, 3-5 mm long. Fl. May-June; fr. July-August.

Coniferous forests and dry pine woods, mossy bogs, especially sphagnum peats, hummocks, banks of muddy rivers and streams, in the tundra.— Arctic: Arc. Eur., Arc. Urals, Arc. Sib., An., Chuk.; European part: Kar.-Lap., Lad.-Ilm., Dv.-Pech., Balt., U. Dnp., U. V., V.-Kama, M.D., V.-Don, Transc.; W. Siberia: all regions; E. Siberia: All regions; Far East: Ze.-Bu., Uss., Uda, Okh., Sakh., Kamch. **Gen. distr.:** Arc., Scand., Atl. Eur., Centr. Eur., N. Mong., N. Am. from Alaska to Newfoundland, Greenland (W. part). Described from Scandinavia. Type in London.

Genus 1102. **CHAMAEDAPHNE*** MOENCH

Moench, Meth. pl. (1794) 457.— Cassandra D. Don in Edinb. new phil. Journ. XVII (1834) 158.

Calyx persistent, 5-parted, furnished at base with 2 bracteoles; corolla urceolate-campanulate, 5-lobed; stamens 10, the locules of anthers prolonged into straight horns, opening by oblique apical pores, attached to filament near the base of horns; capsule depressed-globose, 5-loculed, loculicidal; seeds numerous, small, angular, lustrous.

This monotypic circumpolar genus is common in the northern half of Europe; N. Asia; N. America from Alaska to Allegheny Mts. (southern limit), Michigan and Newfoundland; rarely occurring in Japan.

Chamaedaphne calyculata nana Lodd. in Pliocene layers of Kamch. (Malaya Chazhma R.)

76

1. **Ch. calyculata** (L.) Moench, Meth. pl. (1794) 457; Kom. Fl. Man'chzh. III, 210; Small in N. Amer. Fl. 29, 1, 55; Kom. Fl. Kamch. III, 3; Hulten, Fl. Kamtch. IV, 33; Kryl. Fl. Zap. Sib. IX, 2114.— *Andromeda calyculata* L. Sp. pl. (1753) 394; Pall. Fl. Ross. I, 2, 53.— *Lyonia calyculata* Rchb. Fl. Germ. exc. (1830) 414; Fedch. i Fler. Fl. Evrop. Rossii, 725; E. Buschin Fl. Sib. i Dal'n. Vost. II (1915) 78.— *Cassandra calyculata* D. Don in Edinb. new phil. Journ. XVII (1834) 158; Ldb. Fl. Ross. II, 2, 911.— *Daphnidostaphylis Fendleriana* Klotzch. in Linnaea, XXIV (1851) 80.— *Cassandra dahurica* Grum-Grzhim. et Semen. Opis. Amur. obl. (1894) 287, nom. nud.— Ic.: Pall. Fl. Ross. I, 2, tab. 72, f. 1; Sims in Bot. Mag. 31,

* From Greek *chamai* = on the ground, i.e., low, and *daphne* = laurel.

tab. 1286; Lodd. in Bot. Cab. 6 (1821) tab. 530; Rchb. Icon. XVII, tab. 1161; f. 1-14; Drude in Engl. — Pr. Pflanzenf. IV, 22, f. 12, A, B, C; Fedch. i Fler. 1.c., Fig. 605; E. Busch, 1.c. 80 et var. *nana* (Loddig.) E. Busch, 1.c. III (1919) 81. — Exs.: GRF, No. 423; Pl. Finland. exs. No. 317, a, b.

An evergreen many-branched shrub, 17-50 cm tall (17-24 cm var. *nana* (Loddig.) E. Busch); young branchlets lepidote and pubescent, old ones covered with grayish-brown bark; leaves coriaceous, oblong-oval or oblong-lanceolate, obtuse or subacuminate, 11-50 mm long, 3.5-16 mm broad, (11-17 mm long, 3.5-5.5 mm broad — var. *nana* (Loddig.) E. Busch), the slightly revolute margin obscurely denticulate, dull-green with a concave midrib above, the lower side ferruginous-green with prominent midrib, the minute whitish or rusty peltate scales covering both surfaces; the petiole 0.5-3 mm long (0.5-1.5 mm in var. *nana* (Loddig.) E. Busch); flowers nodding in 1-sided leafy terminal clusters; pedicels 1.5-2 mm long; bracteoles round, tightly appressed to calyx; calyx small, 5-parted, scurfy; sepals 1.5-3 mm long, 1-1.5 mm broad; corolla white, oblong-ovoid, 5-lobed, 4.5-6.5 mm long; filaments dilated at base; style cylindric, equaling the corolla or slightly exserted; capsule depressed-globose, 2-2.5 mm long. Fl. May-July; fr. July-September.

Tundra, mossy bogs — mostly sphagnum, damp woods, balds, and shores of rivers and lakes. — Arctic: Arc. Eur., An.; European part: Kar.-Lap., Dv.-Pech., Bal., Lad.-Ilm., U. Dnp., U. V., V.-Kama, Urals, M. Dns., M. D., V.-Don, N. Transv.; W. Siberia: all regions; E. Siberia: all regions; Far East: Ze.-Bu., Uss., Uda, Sakh., Okh., Kamch. **Gen. distr.:** Scand., Centr. Eur. (N. Poland), Manch., N. Japan, N. Am. Described from Centr. Europe. Type in London.

77 Note. The variety *nana* (Loddig.) E. Busch is more associated with habitats of the balds type. There are numerous transitions between the type and this variety and there is little material to represent the extreme forms of var. *nana*, so that for the present it must be retained as a variety.

Genus 1103. **EPIGAEA** * L.

L. Sp. pl. (1753) 395. — *Orphanidesia* Boiss. et Bal. in Boiss. Pl. or. nov. Dec. I (1875) 3.

Calyx of 5 large, dry sepals imbricated, in the bud; corolla deciduous, salverform of infundibuliform; stamens 10, the filaments hairy at base; anthers prolonged into small obtuse callous protuberances, opening by a slit over their whole length; capsule globose, 5-loculed, 5-valved, loculicidal; seeds alveolar, numerous in each locule. Low prostrate evergreen shrubs, vested with long ferruginous glandular hairs.

Boissier and Balansa erroneously described *Orphanidesia*. Our Caucasian representative, *O. gaultherioides* has been shown to belong to the genus *Epigaea* and should be renamed *Epigaea gaultherioides* (Boiss. et Bal.) Takht. It must be noted, however, that Boissier himself points out in his description of the genus *Orphanidesia* the close resemblance to the genus *Epigaea*, the only distinguishing character being the mode of anther dehiscence: in *Orphanidesia* the anthers open by pores and in the case of *Epigaea* they open over their

* From Greek *epi* = on, and *ge* = earth, an allusion to the creeping habit of the shrub.

whole length. Examinations of the anthers of all our Caucasian specimens showed that they open by a slit.

The genus contains three species: *E. repens* L. in the eastern part of N. America, *E. asiatica* Maxim.—in Japan, and *E. gaultherioides* (Boiss. et Bal.) Takht.—in SW Transcaucasia and in Turkish Lazistan. The difference between our species and the other two is in the shape and size of corolla and inflorescence. Our species has a large corolla with a short tube and relatively broad limb, and thus almost funnelform; the inflorescence consists of 1-2, rarely 3 or 4 widely spaced flowers. In the case of *E. repens* and *E. asiatica* the corolla is much smaller, with a long tube (salverform) and the more numerous closely spaced flowers form a very dense cluster.

1. *E. gaultherioides* (Boiss. et Bal.) Takht. in Not. syst. Inst. Bot. Tiflis. 10 (1941) 32.—*Rhododendron gaultherioides* Boiss. et Bal. in Bal. Pl. Pont. exs. (1866) No. 359.—*Orphanidesia gaultherioides* Boiss. et Bal. in Boiss. Pl. or. nov. Dec. I (1875) 4; Boiss. Fl. or. III, 968; Kuzn. in Mat. Fl. Kavk. IV, I, 490; Medv. Dr. i. kust. Kavk. 194.—Ic.: Dieck in Gartenfl. (1891) f. 87.—Exs.: Bal. Pl. Pont. No. 359; Fl. cauc. exs. No. 42; Herb. Fl. Cauc. No. 231.

78

A low spreading evergreen shrub up to 0.5 m tall, with short ascending branches; leaves elliptic, short-acuminate, 6-11 cm long, 3-5.5 cm broad, coriaceous, the veins on the upper side sparsely covered with long ferruginous hairs, the veins on the upper side and the margin densely so, the petiole 0.5-1.5 cm long; flowers in 1- or 2- rarely 3-flowered clusters in the axils of upper leaves; pedicels furnished at the base with one narrowly lanceolate ciliate bracteole and 2 ovate acuminate glabrous hyaline-margined bracteoles 10-13 mm long and 6-8 mm broad; calyx of 5 oblong acuminate sepals 12-15 mm long; corolla pale rose-colored, broadly funnelform, with 5 lobes; stamens 10, the anthers narrow-oblong, the filaments bearded at base; stigma flattened; capsule globose, 0.9 mm long, loculicidal. Fl. April-June; fr. June (Plate I, Figure 3).

Among relict vegetation of Adzharistan, in *Betula Medvedevii* woods and on the margins of *Rhododendron Ungernii* and *Rh. ponticum* thickets.—Caucasus: W. Transc. (Adzharistan). **Gen. distr.:** Turkish Lazistan. Described from Turkish Lazistan. Type in Geneva.

Economic importance. A decorative shrub, not yet in cultivation.

Subfamily IV. **GAULTHERIOIDEAE** (Drude). *E. Busch*, comb. n.; Drude in Engl.—Pr. Pflanzenf. IV, 1 (1897) 45, pro trib.—Fruit berrylike or a capsule, loculicidal; seeds ovoid-globose, wingless, with a reticulate-ribbed coat; corolla deciduous, campanulate or urceolate; anthers with hornlike appendages; calyx accrescent, surrounding the fruit.

Genus 1104. **GAULTHERIA** * L.

L. Sp. pl. (1753) 395.

Calyx with 5 triangular lobes, accrescent and becoming fleshy after flowering, enclosing the 5-lobed capsule but not fused with it; corolla

* Dedicated to Gaulthier, a botanist and physician in Quebec.

deciduous; stamens 10, with arched filaments; each anther-sac with 2 awns; capsule globose, 5-loculed.

This comprehensive genus is represented by 24 species in North America. It is also represented in Japan. In the USSR there is only a single species, *G. Miqueliana*, and it is confined to Sakhalin Is.

1. *G. Miqueliana* Takeda in Bot. Mag. Tokyo, XXXII (1918) 195.—*G. pyroloides* Hook. f. et Thoms. ex Miquel in Ann. Mus. bot. Lugd.-Bat. I (1863-1864) 30, p.p. (quoad pl. jap.); Maxim. in Bull. Acad. Sc. Petersb. XVIII (1873) 44.—Ic.: Takeda, l.c. 107, f. 1-5.

- 79 An evergreen shrub, 20-35 cm tall, the young branchlets sparsely white-pubescent; leaves pale green, coriaceous, oval, 14-25 mm long, 9-14 mm broad, the margin slightly thickened serrulate with a dark gland at the end of each tooth, acutish or obtusish, terminating in a callous point, reticulate with concave veins above and convex beneath, the petiole 1.5-2 mm long; racemes 1-4-flowered, the flowers in bundles of 1-4, arising from buds on preceding year's shoots; pedicels subtended by an oval bud scale and bearing below the flower 2 oval acuminate ciliate bracteoles; calyx with 5 triangular ciliate-margined puberulent lobes 1-5 mm long, accrescent after flowering and enclosing the capsule; corolla ovoid, 5-6.5 mm long, with very short lobes; stamens 10, the filaments tubercular, dilated at base; anthers half as long as the filaments, each anther-sac surmounted by 2 crenulate awns; capsule surrounded by the fleshy accrescent calyx; seeds small, lustrous. Fl. June; fr. September.

In thin deciduous and Korean-pine woods and among *Pinus pumila*.—Far East: Sakh. (Kurile and Sakhalin Is.). **Gen. distr.:** Japan. Described from Japan. Type in Japan.

Subfamily V. **ARBUTOIDAE** (Drude) E. Busch, comb. n.; Drude in Engl.—Pr. Pflanzenf. IV, 1 (1897) 47, pro trib.—Fruit a capsule or berry; seeds ovaloid or ellipsoid, flattened; corolla deciduous, ovoid-urceolate; anthers appendaged.

Genus 1105. **ARBUTUS** * L.

L. Sp. pl. (1753) 395.

Calyx small, 5-parted; corolla globose-ovoid, deciduous, with 5 recurved lobes; stamens 10, anthers with awnlike appendages, opening by apical pores; fruit a 5-locular mealy berry with numerous small seeds.

Of over twenty species, only two occur in the USSR and only one of these, *A. unedo*, in cultivation — in the Crimea and W. Transcaucasia. The other species, *A. andrachne* grows wild in W. Transcaucasia (in Abkhazia and in former Artvin Province along the Coruh R.) and in the Crimea along the south coast.

1. Leaves oblong, pointed at both ends, serrate, on petioles 0.4-1.5 cm long; panicle glabrous. 1. *A. unedo* L.

* Ancient Latin name of *Arbutus unedo*.

80 + Leaves ovate to oblong-ovate, entire or slightly crenulate, on petioles 1.4-3 cm long; panicle glandular-pubescent. . . . 2. *A. andrachne* L.

1. *A. unedo* L. Sp. pl. (1753) 395; DC. Prodr. VII, 2, 581; Boiss. Fl. or. III, 966; Kuzn. in Mat. Fl. Kavk. IV, 1 (1901) 36.—*A. serratifolia* Salisb. Prodr. stirp. (1796) 288.—*Unedo edulis* Hoffmnnsg. et Link, Fl. Portug. I (1809) 415.—Ic.: Rchb. Fl. Germ. tab. 1167, f. 1-9; Fl. Graec. tab. 373; C.K. Schn. Laubholzk. II, f. 354, i-k,—Exs.: Fl. Graec. No. 489; Heldr. Herb. Graec. Norm. No. 956.

An evergreen tree or shrub, with dark wrinkled bark; leaves oblong-elliptic, pointed at both ends, 4.5-10 cm long, 1.8-3.4 cm broad, coriaceous, serrate, dark green above, the petiole 0.4-1.5 cm long; inflorescence a terminal glabrous panicle; flowers subtended by scalelike bracteoles, the pedicels 2-3 mm long; calyx patelliform, with 5 rounded lobes; corolla waxy-white, ovoid, 0.7-1 cm long, constricted at the mouth, with short lobes; berries large, globose, red, papillose-warty. Fl. April; fr. June-July.

Cultivated in gardens of the Crimea and W. Transcaucasia.—**Gen. distr.:** Mediterranean. Described from the Mediterranean area. Type in London.

2. *A. andrachne* L. Sp. pl. (1762) 566; Ldb. Fl. Ross. I, 2, 908; Koch in Linnaea, XXIII, 623; Boiss. Fl. or. III, 966; Shmal'g. Fl. II, 183; Kuzn. in Mat. Fl. Kavk. IV, 1, 37; C.K. Schn. Laubholzk. II, 542.—Ic.: Fl. Graec. IV (1823) tab. 374; C.K. Schn. l.c.f. 355, h-k.—Exs.: Th. Kotschy, It. cilic. No. 281; Fl. Graec. exs. No. 78; A. Callier, It. taur. II, No. 147; GRF, No. 928; Fl. Palaest. exs. No. 366.

A tree 5 m tall, with flexible branches, the smooth red bark occasionally peeling off; leaves wintering, coriaceous, ovate to oblong-ovate, obtuse, sometimes acuminate, entire or serrate (var. *serratifolia* (O. Kuntze) Kusn.), glaucous beneath, the petiole 1.4-3 cm long; panicles terminal, glandular-pubescent, subtended by scalelike bracts, the pedicels 2-5 mm long; calyx with 5 rounded-ovate lobes; corolla white or faintly yellowish, 83 ovoid, 4-5 mm long, constricted at the mouth, with short lobes; berries small, numerous, globose, orange or brownish-orange, reticulate. Fl. April-May; fr. June.

Coastal rocks.—European part: Crimea (S. coast); Caucasus: W. Transc. (coastal rocks). **Gen. distr.:** Bal.-As. Min., E. Med. Described from the Mediterranean area. Type in London.

Note. *A. andrachne* occurs in the USSR both in its typical form and as var. *serratifolia*. The typical form is known in the USSR only from Crimea, where var. *serratifolia* with distinctly serrate leaves also occurs rather frequently. In Transcaucasia, the only form to be found is var. *serratifolia* and the typical form has been erroneously reported.

Economic importance. The wood of this species has a very beautiful white color with a brownish tint; it is hard, compact, and workable. Leaves are used in tanning. A nectariferous plant.



Plate III

1. *Botryostegia bracteata* (Maxim.) Stapf, flowering branch, flower, stamen, pistil, fruit.
2. *Arctous erythrocarpa* Small, fruiting branch, longitudinal section of flower, a detail of flower lobe.
3. *Eubotryoides Grayana* (Maxim.) Hara, flowering branch, fruit, longitudinal section of flower.

Calyx persistent, 5-lobed; corolla ovoid, with 5 rounded teeth; stamens 10; anthers globose, opening by oval apical pores, with recurved appendages; fruit a berrylike mealy drupe with 5 nutlets.

1. **A. uva-ursi** (L.) Spreng. Syst. II (1825) 287; Ldb. Fl. Ross. II, 2, 909; Shmal'g. Fl. II, 183; Kuzn. in Mat. Fl. Kavk. IV, 1, 39; Kom. Fl. Man'chzh. III, 212; E. Buschin Fl. Sib. i Dal'n. Vost. III, 84; Medv. Der. i kust. Kavk. 193; Hulten, Fl. Kamtch. IV, 36; Kryl. Fl. Zap. Sib. IX, 2115. — *Arbutus uva-ursi* L. Sp. pl. (1753) 395; Pall. Fl. Ross. I, 2, 48. — *Arbutus acerbus* Gilib. Fl. lithuan. I (1781) 5. — *Uva-ursi procumbens* Moench, Meth. pl. (1794) 470. — *Mairania uva-ursi* Desv. in Desv. Journ. bot. (1813) 37. — *Arctostaphylos officinalis* Wimm. et Grab. Fl. Siles. I (1827) 391. — *Uva-ursi uva-ursi* Britton in Britton et Brown, III. Fl. ed. 2, II (1913) 693; Small, N. Amer. Fl. 29, I, 94. — Ic.: Volf and Palib. Der. i kust. 301; Fedch. i Fler. Fl. Evrop. Rossii, Fig. 606; Maevsk. Fl. Sr. Ross. (1940), Fig. 233; Busch, l. c. 86. — Exs. - Pl. Finland. exs. No. 315.

A prostrate evergreen shrub, 25-130 cm tall, with dark-brown bark; leaves oblong-obovate, 12-26 mm long, 4-9 mm broad, thick, coriaceous, glabrous (at first pubescent on the margin), dark green, lustrous, and reticulate above, paler beneath, entire, gradually tapering into the petiole, which is 3-5 mm long; flowers in short drooping racemes at the ends of branches; pedicels shorter than the flowers, subtended by a bract 1.5-2 mm long and 2 bracteoles 0.5 mm long; bracts and bracteoles puberulent; bracts equaling and covering the pedicels, the bracteoles shorter; calyx minute, the 5 teeth wide open, ciliolate on the margin; corolla pink, 5-6 mm long, 5-lobed, covered inside with stiff hairs, these reaching nearly to the mouth of corolla; stamens with dark-red anthers, the filaments dilated at base, the dilated part covered with long hairs and warts; style somewhat shorter than corolla; berry mealy, globose, red, 6-8 mm long. Fl. May-July; fr. July-September.

Pine woods, often with *Cladonia* or heath undergrowth, in broadleaf woods on sandy soil, in thin birch and larch woods, among *Pinus pumila* thickets, and in dry sandy tundra. — Arctic: Arc. Eur.; European part: Kar.-Lap., Dv.-Pech., Lad.-Ilm., U. V., V.-Kama, Balt., U. Dnp., U. Dns., M. Dnp., V.-Don, Urals; W. Siberia: Ob, Irt., Alt.; E. Siberia: all regions; Far East: Ze.-Bu., Uda, Sakh., Okh.; Caucasus: W. Transc., Cisc. **Gen. distr.:** Arc., Scand., Atl. and Centr. Eur., N. Med., Bal., N. Am., Greenland. Described from Scandinavia. Type in London.

Note. This species, typical for the forest zone of the northern hemisphere, penetrates to some extent into the tundra.

Economic importance. A decoction of the leaves is used in medicine against disorders of the bladder. The active substance is the glycoside arbutin. The leaves, stems, and branches are used in the tanning of hides, especially in the production of morocco leather to give the hides a gray

* From Greek *arktos* = bear, and *staphylos* = berry.

or black color. Northern peoples use the leaves as a substitute for tobacco or in a mixture with tobacco.

Genus 1107. **ARCTOUS*** (A. GRAY) NIEDENZU

Niendenzu in Engl. Bot. Jahrb. XI (1890) 180. — *Arctostaphylos* § *Arctous* A. Gray, Syn. Fl. N. Amer. 2 (1878) 27.

Calyx persistent, 5-parted; corolla with 5 recurved lobes; stamens 5, the anthers oblong-ovaloid, opening by a broad terminal slit to 1/2-1/3 the length, with small thick appendages or rarely unappendaged; fruit with 4 or 5 separate nutlets.

The genus contains 4 species, 3 of which occur in the USSR.

- 85 1. Fruits bright red, not turning dark in fall; leaves thin (papery in the herbarium), the network of nerves not protruding; corolla lobes erose and sparsely ciliate on the margin. 3. *A. erythrocarpa* Small.
- + Fruits red at first, turning blackish-purple in fall when fully ripe; corolla lobes fringed with long hairs 2.
2. Leaves obovate or spatulate, obtuse or round-tipped, up to 7 cm long, the margin with rather large obtuse teeth; flowers greenish or yellowish, broadly urceolate, strongly constricted at the mouth. 2. *A. japonica* Nakai.
- + Leaves narrower, mostly oblong-obovate or oblong-elliptic, up to 4 cm long, often acute, the margin finely serrate; flowers white, more elongate 1. *A. alpina* (L.) Niedenzu.

Series 1. **Alpinae** Pojark. — Fully ripened fruit (in fall) blackish-purple, juicy, but not edible; leaves rather firm, the network of small veins protruding. Plants of the alpine zone and high-mountain tundra. Two species, both occurring in the USSR.

1. *A. alpina* (L.) Niedenzu in Engl. Bot. Jahrb. XII (1890) 180; C.K. Schn. Laubholzk. II, 545; Small, N. Amer. Fl. 29, 1, 102; E. Busch in Fl. Sib. i Dal'n. Vost. III, 89, p.p.; I. Kuzn. in Fl. Az. Ross. 9, 61, p.p.; Kom. Fl. Kamch. III, 9, p.p.; Kryl. Fl. Zap. Sib. IX, 2116. — *Arbutus alpina* L. Sp. pl. (1753) 295. — *Mairania alpina* Desv. in Journ. Bot. II, 1 (1813) 37; Kom. and Alis. Opred. rast. Dal'nevost. kr. II, 842 (cum aut. Sprgl.). — *Arctostaphylos alpina* Spreng. Syst. II (1825) 287; DC. Prodr. VII, 2, 585; Ldb. Fl. Ross. II, 2, 908; Hulten, Fl. Kamtch. IV, 34. — Ic.: Warming, Struct. Arctic Flow. Pl. I (1908) 34, 36, Figs. 23, 24; C.K. Schn. l.c. 544, f. 356, 1-r, f. 357, s-u; E. Busch, l.c. Fig. on page 91.

A sprawling deciduous shrub, 20-60 cm long, with decumbent branches and brown exfoliating bark; leaves 12-38 mm long, 7-17 mm broad, obovate or oblong-elliptic, finely serrate, cuneately long-tapering into a ciliate petiole 7-18 mm long, thin, glabrous, the dense network of small veins very prominent on the lower side; flowers in short racemes at the ends of the preceding year's branches; pedicels 5-5.5 mm long, slightly shorter than the elliptic acuminate whitish or pinkish ciliate-margined bracts; calyx minute, the 5 broad smooth lobes 0.5 mm long; corolla greenish-white, 4-6 mm long, 5-lobed, the inside of tube and the lobes covered with

86

* From Greek *arktoos* = boreal.

short stiff hairs; stamens half as long as corolla, with dark-red anthers, the filaments strongly inflated at base, gradually attenuate toward summit, hairy, the hairs on the inflated part interspersed with warts; style longer than the stamens, but included in the corolla; berry globose, red at first, turning blackish-purple in late fall, 6-8 mm in diameter. Fl. May-June; fr. August-September.

Sandy, moss-and-lichen, and mottled tundra; balds; rocks, stony slopes, and screes; sphagnum bogs.— Arctic: Arc. Eur., Arc. Sib., An., Chuk.; European part: Kar.-Lap., Dv.-Pech., Urals, U. Dns. (Carpathians); W. Siberia (alpine zone): Alt.; E. Siberia: Ang.-Say., Dau., Lena-Kol., Far East: Ze.-Bu., Uss., Uda, Okh. Kamch. (N. part); Soviet Central Asia: Dzu.-Tarb., and T. Sh. (E.). **Gen. distr.:** Arc. Scand. (alpine zone), Centr. Eur. (Jura, Alps, Apennines, Carpathians), Atl. Eur., Med. (Pyrenees, Yugoslavia), N. Mong., Dzu.-Kash., mountains of N. Am. (from Alaska to Newfoundland, southern limit Quebec), Greenland. Described from Scandinavia. Type in London.

Note. Leaves turning red to blackish-purple in fall after the first spells of frost; they turn brown after winter and persist on the plant for some time. *A. alpina* flowers before or at the time of leaf appearance. The berries cause vomiting and stomach pains.

2. **A. japonica** Nakai in Tokyo Bot. Mag. XXXV (1921) 134; Makino et Nemoto, Fl. jap. (1931) 863; Sugawara, III, fl. of. Saghal. IV, 1497.— *Arctostaphylos alpina* Ldb. Fl. Ross. II (1846) 908, p.p.; Fr. Schmidt, Fl. sachal. in Mem. Acad. Sc. Petersb. VII ser. XII, 2, 157; Fr. et Sav. Enum. pl. jap. II, 426; B. Fedtsch. Fl. il. Command. 83, non Sprgl.— *Mairania alpina* Stejneger, Fur-seal Isl. List. pl. (1898) 359, non Desv.— *Arctous alpina* Matsum. Ind. pl. jap. II (1912) 451; I. Kuzn. in Fl. Az. Ross. 9, 61, p.p.; E. Busch in Fl. Sib. i Dal'n. Vost. 3, 89, p.p.; Kudo in Jap. Journ. Bot. II, 272; Kom. Fl. Kamch. III, 9, p.p. non L.— *Arctostaphylos alpina* var. *japonica* Hulten, Fl. Kamtch. IV (1930) 35.— Ic.: Hulten, l.c. tab. IV, b; Sugawara, l.c. tab. 695.

Closely resembles the preceding species but differs in the following characters: shrub more diffuse; leaves larger (up to 7 cm long and 2-7 cm broad), obovate to subspatulate, more strongly tapering into the petiole, with a broad obtuse apex, the teeth bigger, obtuse, the texture firmer, the network of veins more protruding; flowers yellowish or greenish, broadly urceolate, more strongly constricted in upper part than those of *A. alpina*. Fl. second half of June; fr. end of July.

Subalpine and alpine zones, stony lichen tundra, and mossy bogs, often forming compact carpets.— Far East: Sakh., Kamch. (S. part and the E. coast). **Gen. distr.:** Japan (N. part of Honshu and Hokkaido), Ber. (E. Aleutians and Alaska). Described from Japan. Type in Tokyo?

Series 2. **Erythrocarpae** Pojark.— Fruit red, not turning dark in fall, very watery; leaves thin (papery in the herbarium), the network of small veins not protruding or only slightly protruding. Forest plants. In addition to the indigenous *A. erythrocarpa* Small, the series includes the species *A. rubra* (Rehd. et Wils.) Nakai in China and Korea.

3. *A. erythrocarpa* Small in N. Amer. Fl. 29, 1 (1914) 103. — *Arctostaphylos rubra* Fernald in Rhodora, 16 (1914) 32, p.p. (excl. pl. chin.).

A sprawling, strongly branched shrub; old branches long, slender, decumbent, embedded in the moss, up to 4.5-5 mm in diameter, covered with brown exfoliating bark; young branches and shoots short, ascending; leaves thin with merely the midrib protruding, bright green above, glaucous beneath, glabrous or with scattered setiform hairs above, sparingly ciliate-margined in lower part, oblanceolate to lance-obovate, more or less pointed at apex, long-tapering toward the petiole into a narrowly cuneate base, 2.5-5 cm long, 0.7-2.8 cm broad, the margin shallowly serrulate or crenulate, the blade 2-3 times as long as the petiole; flowering before appearance of new leaves; flowers in a short terminal 1-5-flowered raceme, subtended by 2-3 whitish bracts; pedicels 3-5 mm long, elongating in fruit up to 12 mm; calyx minute, depressed, green, with 5 broadly triangular teeth; corolla 4-7 mm long, 3-6 mm broad at base, greenish-white or rosy-white, urceolate, constricted at the mouth, the lobes broadly rounded or subquadrate, about 1/5 the length of the tube, finely erose, glabrous or sparsely ciliate outside or inside and in the latter case also ciliate inside the upper part of the tube; stamens half the length of corolla, the filaments strongly dilated and sparsely setose at base; anthers reddish-brown, globose, the pollen-sacs opening by a broad slit to about 3/4 their length, with a short reflexed dorsal appendage; ovary ovoid, glabrous; fruits bright red or raspberry-red, watery, insipid, edible, 1-1.3 cm in diameter. Fl. May to first half of June; fr. from end of August. (Plate III, Figure 2).

88 Pine, birch, and, especially, larch woods, in the plains and mountains; in larch woods often forming a compact cover; extending in mountains up to 1000 m. — Arctic: Arc. Sib., ? Chuk., An.; E. Siberia: Lena-Kol., except the extreme N., especially in Centr. Yakut ASSR, where it is very common in river basins of the Vilyui, Aldan, and Lena; Ang.-Say., Dau. **Gen. distr.:** Ber., N. Am. (N. part, from Yukon and Alaska to British Columbia and Canada). Described from Alberta in Canada. Type in New York.

Note. The occurrence in the Yakut ASSR of *Arctous* with large red and very watery fruits has already been reported by Gmelin (Flora Sib. IV (1769) 119), but was not subsequently confirmed by any other author. Only recently N. M. Karavaev reported the wide distribution in Central Yakut ASSR of an *Arctous* species differing from *A. alpina* (L.) Niedenzu in bright-red fruits that do not turn dark in fall, large thin leaves with scarcely protruding network of veins, and characterized by different ecology, as it grows in woods and not in the high-mountain tundra. Koravaev studied in detail the geographic distribution of this bright-red-fruited *Arctous* and also found that the Yakutian species displays all the characteristics recorded for *A. erythrocarpa* Small from the Yukon, Alaska, and Canada, and thus the plant has been included in that species. Unfortunately, the absence of flowers on the available American specimens makes it impossible to verify conclusively the identity of the Siberian red-fruited *Arctous* with the American species. Both our plants and the true *A. erythrocarpa* Small have finely erose corolla lobes; these are readily distinguishable from the long-ciliate corolla lobes which characterize *A. rubra* Nakai of Central China and Korea as well as those of the black fruited species *A. alpina* (L.) Niedenzu and *A. japonica* Nakai.

Subfamily VI. **ERICOIDEAE** Drude in Engl. — Pr. Pflanzenf. IV, 1 (1897) 32, 57. — Fruit a capsule; corolla campanulate, persistent; anthers with toothed appendages at base.

Genus 1108. **CALLUNA** * SALISB.

Salisb. in Trans. Linn. Soc. VI (1802) 317.

Calyx 4-parted, colored, scarious, persistent; corolla sympetalous, campanulate, deeply dissected into 4 lobes, shorter than the calyx, persistent in fruit; the base of each anther-sac bears a toothed, reflexed, ligulate appendage; capsule 4-valved, septicidal; leaves small, imbricated.

A monotypic Atlantic genus.

1. **C. vulgaris** (L.) Hill, Brit. Fl. 2, I (1808) 114; C.K. Schn.

Laubholz. II, 563; Small in N. Amer. Fl. 29, 181, cum auct. Salisb.; 89 DC. Prodr. VII, 2, 613; Ldb. Fl. Ross. II, 914; Boiss. Fl. or. III, 968; I. Kuzn. in Fl. Az. Ross. IX, 78; E. Buschin Fl. Sib. i Dal'n. Vost. III, 134; Kryl. Fl. Zap. Sib. IX, 2117. — *Erica vulgaris* L. Sp. pl. (1753) 352. — *E. glabra* Gilib. Fl. lithuan. I (1781) 3. — *Calluna erica* DC. in Lam. et DC. Fl. franc. ed. 3, III (1805) 680. — *C. sagittataefolia* S. F. Gray, Nat. arr. brit. pl. I (1821) 399. — *C. atlantica* Seem. in Journ. of Bot. II (1866) 308. — Ic.: Rchb. Ic. Fl. Germ. XVII, tab. 1862, Figs. 7-11; Vol'f and Palib. Der. i kust. (1904) 297; Maevsk. Fl. Ed. VII, Fig. 234; E. Busch, l. c., Fig. on page 137.

A much-branched evergreen shrub, 30-70 cm tall; leaves 1.75-2.25 mm long and 0.5-0.7 mm broad, sessile, short-linear, trigonous, obtuse, sagittate at base, imbricated in 4 ranks; new shoots arising from the axil of the largest leaf of the preceding year's shoot; flowers with 4 ovate ciliate bracts at base; calyx 4-parted lustrous, scarious, same color as corolla, the lobes 3-3.5 mm long, 2.5-1.7 mm [sic] broad; corolla shorter than the calyx, campanulate, lilac-rose, rarely white (f. *alba* G. Don), dissected to 2/3 into lobes 2.5-2.7 mm long, both calyx and corolla persistent in fruit; stamens 8; style exserted; capsule pubescent, containing few seeds. Fl. July-September; fr. September-October.

Sandy places in pine woods, burned-out areas, and mossy peat bogs, heath-forming. — European part: all regions from the North to the steppes; W. Siberia: U. Tob., Irt. (Borovoe and Berdsk on the Ob), Alt.; E. Siberia: Ang.-Say. (Khakass Autonomous Region, Dzhebitskaya woodland).

Gen. distr.: Scand., Centr. and Atl. Eur., Med. (except S. Italy), Bal.-As. Min., N. Africa (Morocco), Azores, N. Am. (Atlantic Coast). Described from Europe. Type in London.

Note. Specimens with white flowers occur fairly frequently — f. *alba* G. Don, Gen. Syst. III (1834) 628.

Economic importance. *Calluna* produces a large supply of nectar but the honey is dark, tart, and rather bitter (Grukhov, 1950). The twigs and leaves are used as rough forage for livestock as well as in winter bouquets.

* From Greek: kallunein = to sweep; brooms are made of the twigs of this plant.

90 Calyx herbaceous, deeply 4- or 5-parted, usually much shorter than corolla; corolla campanulate or urceolate or oblong-cylindric, 4- or 5-lobed, persistent in fruit; stamens 8 or 10, rarely 4 or 5; filaments inserted at the base of a fleshy hypogynous disk; anthers basifixed, with or without appendages, the pollen-sacs opening by a broad apical pore; ovary 3-loculed, many-ovuled; style cylindric, with a lobed or entire discoid stigma; capsule 3-valved, loculicidal. Subshrubs or shrubs or rarely small trees, with verticillate narrowly linear, acicular, or scalelike leaves; flowers solitary or in terminal umbellate inflorescences, these sometimes gathered in panicles.

About 500 species, most of which are distributed throughout southern Africa. A small number of species occurs in the European Mediterranean area.

1. Leaves, shoots, and calyx-lobes beset with long glandular bristles; flowers carneous, in compact subcapitate umbels which are solitary or in clusters of 2-4. 1. **E. tetralix** L.
- + Long bristlelike hairs lacking; flowers white, in loose 3- or 4-flowered umbels at the end of short leafy branchlets, many of these gathered in a long narrow pyramidal panicle. 2. **E. arborea** L.

1. **E. tetralix** L. Sp. pl. (1753) 353; Ldb. Fl. Ross. II, 915; Klinge, Fl. Est-., Liv- u. Curland, 357; Shmal'g. Fl. II, 185; Fedch. and Fler. Fl. Evrop. Rossii 729; Bickis, Latvijas Augu Noteic. (1946) 236. — *E. botuliformis* Salisb. in Trans. Linn. Soc. VI (1802) 369. — *Tetralix septentrionalis* E. May. Preuss. Pflanzengatt. (1839) 100. — *Ericoides tetralix* Kuntze, Rev. Gen. II (1891) 967. — Ic.: Rchb. Ic. Fl. Germ. XVII, tab. 1163, f. 1-3; C.K. Schn Laubholz. II, f. 368, y-z; Hegi, Fl. V, 3, f. 2702.

A much-branched shrub, 15-50 (70) cm tall; branches slender, stiffly erect, densely leafy, puberulent and beset with long glandular bristles; leaves in whorls of 4, linear, 2-4 (5) mm long, 0.3-0.8 mm broad, acutish, revolute, dark green, glaucescent by dense short pubescence and ciliate on the margin with long spreading mostly glandular setiform hairs; petioles 0.5-0.75 mm long, glabrous on both sides, tomentose and ciliate; flowers in 2's-4's in compact subcapitate umbels at the ends of elongated shoots, these bearing fewer leaves than sterile branchlets; inflorescence usually solitary, terminal, very rarely 2 or 3 short branchlets bearing 2-5-flowered umbels present below the terminal inflorescence; pedicels shorter than the
91 flowers, 2-3.5 mm long, white-tomentose, with green lanceolate bracts inserted close to the flower; calyx 4-parted down to base, the calyx lobes and the bracts white-tomentose and beset on the margin with long glandular bristles; corolla carneous (rarely white — f. *alba* Rgl.), oblong-urceolate, 6-7 mm long, the tube 6-7 times as long as the triangular-ovate lobes; stamens 8, as long as the calyx-tube; anthers bright red, dorsifixed in their lower part at the base of long reflexed awns which are glabrous or sometimes with a few distant teeth; ovary silvery-white by dense appressed pubescence; style equaling the corolla, with a capitate stigma; capsule white-tomentose, slightly depressed, faintly 8-angled; seeds globose-ovoid, granular, 0.3-0.4 mm long. Fl. July-August.

* From Greek *Erek* = the ancient Greek name of the plant.

** Prepared by A. I. Poyarkova.

Peat meadows, mossy bogs, and wet places in heaths. Very infrequent. — European part: Balt. (in Latvia, in the vicinity of Liepaya-Ziemupes).

Gen. distr.: Scand. (S. and SW part), Centr. Eur. (NE part), Atl. Eur., Iceland, Faroe Islands. Described from N. Europe. Type in London.

Note. 1) The eastern limit of this West European species, which represents an Atlantic floristic element, passes or, more correctly, passed near Haapsalu, until the plant was eradicated there in 1854. The vicinity of Liepaya is apparently the only locality in the USSR detached from the main distribution area which stretches as far as the Gulf of Danzig.

2) *E. baccans* L., *E. herbacea* L., and *E. carnea* L. have also been erroneously reported for the Baltic States.

Economic importance. Decorative.

2. ***E. arborea*** L. Sp. pl. (1753) 353; Ldb. Fl. Ross. II, 915; Boiss. Fl. or. III, 970; Medv. Der. i kust. Kavk. 161; Kuzn. in Mat. Fl. Kavk. IV, 1, 48; Grossg. Fl. Kavk. III, 203. — *Ericoides arboreum* Kuntze, Rev. Gen. II (1891) 966. — Ic.: Rchb. Ic. Fl. Germ. XVII, tab. 1164, fig. 1-3; Engl. - Pr. Pflanzenf. IV, 1, fig. 34; C.K. Schn. Laubholz. II, f. 369, a-f; Hegi, Fl. V, 3, f. 2699-2701.

A shrub or tree, up to 4-6 m tall, with rigidly erect branches; young shoots and 2-3-year-old branches densely covered with spreading branched hairs; leaves bright green, glabrous, usually in whorls of 3, rarely 4 or 5, narrowly linear, obtusish, revolute, the short petiole appressed to the shoot; flowers fragrant, 3 (4) in umbels borne at the end of short and very slender leafy branchlets gathered into narrowly pyramical panicles up to 50 cm long; pedicels glabrous, nodding, bearing near the middle 3 (2) mostly subverticillately approximate bracteoles; calyx half as long as corolla, dissected nearly down to base into ovate to oblong-ovate subacute lobes, minutely ciliolate on the margin (magnifying glass!); corolla 2.5-4 mm long, white, campanulate, not constricted at the mouth, the tube 1 1/2-2 times as long as the broadly triangular or rounded-triangular obtuse teeth; stamens 8, slightly shorter than corolla; anthers dorsifixed at the base of 2 short obtuse appendages; style exserted; ovary glabrous; capsule included in the corolla, ovoid-globose, ca. 1.5-mm long; seeds 0.2-0.3 mm long. Fl. February-April.

In the undergrowth of oak woods on coastal hills. — Caucasus: W. Transc. (only in Abkhazia, in the vicinity of Pitsunda). **Gen. distr.:** Centr. Eur. (S. Tyrol), Med. (S. Europe, N. Africa, Canary Is.), Bal.-As. Min. (E. as far as and including the Pontic Range). Described from S. Europe. Type in London.

Note. *E. arborea* L. is a Tertiary relict element of the hemixerophyllous flora of the Mediterranean area. Some authors (e.g., N.I. Kuznetsov) maintain that the aboriginal status of this species in the Pitsunda area has not yet been definitely established.

Genus 1110. **BRUCKENTHALIA** * RCHB. **

Rchb. Fl. Germ. exc. I (1830) 413.

Calyx 4-lobed, persistent; corolla campanulate, 4-lobed, coriaceous, persistent in fruit; stamens 8, included in the corolla-tube, the filaments

* Named after the Australian S. Bruckenthal.

** Prepared by A. I. Poyarkova.

connate at base, inserted at the base of corolla; anthers ellipsoid, attached to filament below the middle, the pollen-sacs opening by a broad apical pore, which narrows downward; style cylindric, exerted, with a flattened stigma; fruit a 4-loculed loculicidal capsule enclosed in the calyx-tube. An evergreen shrub, the small leaves in whorls of 4 or partly alternate; flowers in short dense terminal clusters.

A monotypic genus.

1. **B. spiculifolia** (Salisb.) Rchb. Fl. Germ. exc. I (1830) 414; Simk. Enum. pl. Transsylv. 339; C.K. Schn. Laubholz. II, 567; Turkev. in Izv. Bot. Sada Petra Vel. 14 (1914) 449; Prodan, Fl. determ. descr. Roman. I, 2 (1939) 704. — *Erica spiculifolia* Salisb. in Trans. Linn. Soc. VI (1802) 324. — *Erica olympiaca* Sibth. ex. Salisb. l.c. — 93 *Menziesia Bruckenthalii* Baumg. Enum. stirp. Transsylv. I (1816) 333. — *Erica Bruckenthalii* Spreng. Neue Entdeck. I (1820) 271. — *Bruckenthalia "spiculiflora"* DC. Prodr. VII, 2 (1838) 694; Boiss. Fl. or. III, 969; Drude in Engl. — Pr. Pflanzenf. IV, 1, 62; Grecescu, Consp. Fl. Roman. 391; Kuzn. in Mat. Fl. Kavk. IV, 1, IX. — Ic.: Rchb. Ic. Fl. Germ. XVII, tab. 1162, f. 1-6; Sibth. et Sm. Ic. pl. Graec. 4 (1823) tab. 353; C.K. Schn. Laubholz. II, f. 369, p-q. — Exs.: Fl. Hung. exs. No. 69.

A much-branched prostrate evergreen shrub, 10-25 cm tall; branches slender, ascending, densely leafy, densely pubescent with short hairs; leaves horizontally spreading, 3-6 mm long, 0.3-0.5 mm broad, acicular, revolute, terminating in a needlelike point, beset with long-stalked glands; petioles ca. 0.5 mm long, tightly appressed to the branches; flower clusters drooping, dense, 1.5-2.5 cm long; flowers in the axils of linear leaves, these gathered in whorls of 4; pedicels reddish, scabrous, erect, 4-7 mm long; calyx 1.5-2 mm long, the tube about 1 1/2 times as long as the broadly triangular, point-tipped, irregularly toothed lobes, the lobes and most of the tube pink; corolla bright pink, coriaceous, ca. 3 mm long, cut to 1/3 into 4 triangular obtuse minutely denticulate lobes; stamens equaling the corolla-tube, the anthers about as long as the slender filaments; capsule ca. 2 mm long, enclosed in the corolla, slightly 3-grooved, topped by the style; seeds very small, oblong, longitudinally striped. Fl. end of June-July; fr. from August.

Grassy mountain slopes in the subalpine zone, in meadows, and in the higher coniferous-forest zone. Not yet found in the USSR, the nearest location being at the Murgul-su R. in the former Artvin Province of Turkey.

Gen. distr.: Centr. Eur. (E. Carpathians, Banat, Transylvania); Bal.-As. Min. (Rumania, Balkans, Rhodope, Macedonia, NE part of Asia Minor, Pontic Range). Described from Bithynian Olympus [Ulu Dag] near Bursa in Asia Minor. Type not preserved?

Family CXXIV. **VACCINIACEAE** LINDL

Flowers bisexual, regular; calyx fused with ovary, 4- or 5-parted, rarely undivided; corolla sympetalous, dissected into 4-5 lobes or deeply 4-parted, deciduous; stamens free, twice as many as and facing corolla lobes; pollen-sacs prolonged into a tube, opening by apical pores, the

connective sometimes furnished with 2 long or short subulate appendages (spurs); ovary inferior, 4- or 5-locular, with central placentation and numerous ovules; style filiform; fruit a many-seeded berry. Erect shrubs or subshrubs (occasionally small trees) or sprawling subshrubs; leaves entire, evergreen or deciduous, alternate or in 2's-5's at the ends of branches; flowers in a cluster or in 2's or 3's or solitary.

The family contains about 20 genera of which only two occur in the USSR.

Key to Genera

- 1. Corolla campanulate, turbinate or cylindric; stem erect 1111. *Vaccinium* L.
- + Corolla deeply 4-parted; stem decumbent. . . 1112. *Oxycoccus* Adans.

Genus 1111. **VACCINIUM** * L.

L. Sp. pl. (1753) 349.

Calyx 4-5 parted, rarely undivided; corolla campanulate, turbinate or cylindric; stamens twice the number of and facing the corolla lobes, the filaments glabrous or hairy; anthers with short or long appendages (spurs), the connective not spurred; berry blue (glaucous), bluish-black, or red. Shrubs, sometimes trees, mostly subshrubs.

The genus *Vaccinium* contains about 100 species distributed through Europe, Asia, Africa, and North America. Only 7 species occur in the USSR.

Species of the genus *Vaccinium* have been mostly identified from Quaternary layers as seed fragments, while leaf prints are known from the Eocene.

Vaccinium myrtillus L. in the Quaternary of Dv.-Pech. (vicinity of Vologda) — *V. uliginosum* L. in Sarmatian layers of Bl. (Krynka R.); in the Quaternary of U. Dnp. and Ob (Demyanskoe). — *V. vitis idaea* L. in the Quaternary of Dv.-Pech. (Sodinka River near Vologda); in the Quaternary of N. Siberia (from rhinoceros food). — *V. acheronicum* Ung. in the Eocene (Buchak (stage) of U. Dnp. — *V. daphnifolium* Stanisl. in the Eocene Buchak layer of U. Dnp. (Volyanshchina). — *V. praetropicum* Baik. in the Paleocene of Ze.-Bu. (Raichikha**). — *V. hirtellum* Ait. in Pontic layers of W. Transc. (Akhchisakhtari).

- 1. Filaments glabrous; anthers with 2 appendages (section *Euvaccinium* A. Gray) 2.
- + Filaments hairy; anthers unappendaged 5.
- 2. Berries blue or black 3.
- + Berries bright red; leaves in 2's-5's at the end of branches 5. *V. praestans* Lamb.
- 95 3. Shrubs 1.5-3 m tall, with large elliptic leaves 4. *V. ovalifolium* Smith.
- + Shrubs about 0.5 m tall or subshrubs, with small ovate leaves . . . 4.
- 4. Branches terete; leaves entire, glaucous beneath; berries glaucescent-blue with green pulp 2. *V. uliginosum* L.
- + Branches sharply angled; leaves finely serrulate; berries black with dark-purple pulp 3. *V. myrtillus* L.
- 5. Corolla cylindric-funnelform, purple; berry black (section *Cyanococcus* A. Gray). 1. *V. hirtum* Thunb.

* Plant name mentioned by Pliny; Lat. *bacca* = berry.

** [Raichikhinsk since 1944.]

- + Corolla turbinate or campanulate, whitish-pink; berry red or black (section *Vitis idaea* Koch) 6.
- 6. Berry dark red; leaves coriaceous, persistent; a subshrub. 6. *V. vitis idaea* L.
- + Berry black; leaves not coriaceous, deciduous; a large shrub or tree. 7. *V. arctostaphylos* L.

Section 1. **CYANOCOCCUS** A. Gray in Mem. Amer. Acad. New ser. III (1846) 63; Syn. Fl. N. Amer. II, 1 (1878) 1. — Corolla cylindric to infundibular, 5-lobed; filaments of stamens hairy; anthers unappendaged; berry fully or incompletely 10-locular.

1. *V. hirtum* Thunb. Fl. Japon. (1784) 155; DC. Prodr. VII, 574; Fl. Sib. i Dal'n. Vost. III, 96. — *V. Smallii* A. Gray in Mem. Amer. Acad. New ser. VI (1857) 398; Sugawara, III. fl. of Sakhal. 1505. — Ic.: Fl. Sib. i Dal'n. Vost. III, 97; Sugawara, l.c. tab. 688.

A shrub 1-1.5 m tall, with dark-brown bark; leaves deciduous, oblong-oval or lanceolate, acuminate, 4-6.5 cm long and 1-2.5 cm broad, cuneate at base, minutely serrulate on the margin except near base, hairy on the veins especially beneath, the petiole 1-2 mm long; flowers in few-flowered terminal clusters; pedicels 3-4.5 mm long with caducous bracteoles; calyx 5-toothed, the teeth glandular-ciliate 1.5-2 mm long and 1.5-2 mm broad; corolla cylindric, 6-7.5 mm long, purple, the lobes slightly declined; stamens 10, the filaments densely hairy; anthers densely scabrous with short bristles; stamens and style barely exerted; berry 7-10 mm long, black, with persistent calyx-teeth. Fl. June; fr. September.

Coniferous woods on watersheds. — Far East: Sakh. **Gen. distr.:** Japan, N. Am. Described from Japan. Type in Uppsala.

96 Note. Maksimovich (Mel. biol. VIII (1872) 606) distinguishes two varieties of *V. hirtum* Thbg.: *typicum* — a small, strongly branched plant, with small ovate leaves, associated with mountains, and *Smallii* A. Gray — a tall plant with large ovate-lanceolate leaves. Most likely these are merely ecological forms.

Section 2. **EUVACCINIUM** A. Gray, Chlor. Bor. Amer. (1846) 83; Benth. et Hook. Gen. pl. II, 584. — Corolla urceolate or ovoid; filaments of stamens glabrous; appendages of anthers long or short and barely discernible; berry 4- or 5-locular, blue or bluish-black, rarely red; leaves deciduous.

2. *V. uliginosum* L. Sp. pl. (1753) 350; Pall. Fl. Ross. II, 45; Ldb. Fl. Ross. II, 904; Turcz. Fl. baic.-dahur. II, 1, 194; Mat. Fl. Kavk. IV, 1, 42; Kom. Fl. Man'chzh. III, 214; Fl. Az. Ross. 9, 70; in Fl. Sib. i Dal'n. Vost. III, 106; Grossg. Fl. Kavk. III, 202; Kryl. Fl. Zap. Sib. IX, 2121; Sugawara, III. Fl. of Saghal. IV, 1510; M. Popov. Och. rast. i fl. Karpat, 221. — *Myrtillus uliginosus* Drej. Fl. excurs. (1938) 147. — Ic.: Fl. Sib. i Dal'n. Vost. III, 109 and 110.

A shrub up to 0.5-1 m tall, with yellowish-brown or dark-gray bark and terete branches; leaves alternate, small, 5-38 mm long and 4-24 mm

broad, borne on petioles 0.5-1.5 mm long, obovate, usually round-tipped or rarely subacute, entire, slightly revolute, glabrous, light green above, glaucescent and prominently veined beneath; flowers 1-3 at the ends of the preceding year's branchlets, on short drooping pedicels; flowers with a weak but pleasant scent; calyx with 4 or 5 short rounded teeth, 0.5-1 mm long and 1-1.5 mm broad; corolla urceolate, whitish or faintly pink, 3.5-5.5 mm long, with 4 or 5 lobes; stamens 8-10, the filaments glabrous, slightly dilated at base; anthers long-appendaged; style sometimes exserted; berry globose, 9-12 mm long, bluish, with a bloom. the pulp green. Fl. June-July; fr. August-September.

var. *genuinum* Herd. in Tr. Bot. Sada, I (1871) 319. — Ic.: Vol'f and Palib. Der. i kust. (1914) 306; Fl. Sib. i Dal'n. Vost. IX, 109. — A branched shrub up to 1 m tall; leaves obovate, oblong-ovate or orbicular, 11-38 mm long and 7-24 mm broad; growing in woods.

var. *alpinum* E. Busch in Fl. Sib. i Dal'n. Vost. IX (1919) 109, Fig. on page 110. — A low semiprostrate shrub; leaves obovate, oblong-ovate, or oval, smaller, 6-15 mm long and 4-9 mm broad; growing in the tundra and on balds.

97 var. *vulcanorum* (Kom.) E. Busch in Fl. Sib. i Dal'n. Vost. IX (1919) 110, 112. — *Vaccinium vulcanorum* Kom. in Fedde, Repert. XIII (1914) 236. — A sprawling, strongly branched, rather compactly pulvinate shrub; leaves closely approximate, marcescent and persisting for 1-2 years on the branches. Differs from the other varieties in habit and mode of branching. Occurring in the stony tundra of Kamchatka, near the Kronotskii Pass, on the inner crater walls of Krashennikov Volcano, and on the coast of Lavrentiya Bay.

Peat bogs in wet coniferous and broadleaf woods, scrub, among *Pinus pumila* and *rhododendron* thickets, often together with *Ledum palustre* L. — Arctic: Arc. Eur., Nov. Z., Arc. Sib., Chuk., An.; European part: Kar.-Lap., Dv.-Pech., Lad.-Ilm., U.V., V.-Kama, U. Dnp., U. Dns., V.-Don (Penza Region, Gorodishche); Caucasus: E. and W. Transc.; W. Siberia: all regions; E. Siberia: all regions; Far East: Kamch., Okh., Ze.-Bu., Uda, Uss., Sakh. (and Kurile Is.). **Gen. distr.:** Arc., Scand., Centr. and Atl. Eur., Arm.-Kurd., Korea, Japan, Mong. (N.), N. Am., Greenland. Described from N. Sweden. Type in London.

Note. The berries of *V. uliginosum* also vary greatly; they may be quite spherical or ovoid or strongly elongated, ellipsoid, or even pyriform, some attaining large size and up to 12-15 mm long. Nakai (Fl. sylv. Koreana VIII (1919)) lists 4 forms: *f. depressum* Nakai — with depressed ♂ globose berries; *f. ellipticum* Nakai with elongated ellipsoid berries; *f. alpinum* Nakai — with small globose berries; *f. angulobum* Nakai — with squarely elongated berries. B. A. Fedchenko (Bot. Mat. Gerb. Gl. Bot. Sada, IV (1923) 161) described a white-berried variety of *V. uliginosum*, *v. leucocarpum* B. Fedtsch., which he collected in the Shcherbakov (Rybinsk) area in the Proshchinskii Marshes; this form has also been reported for Gor'kii Region (Balakhna) and for the area west of the town of Lomonosov. This wide range of forms of *V. uliginosum* may be important in selection work with this plant, as the berries vary in taste as well as in shape and size.

Economic importance. The somewhat watery but sweet berries are gathered in large quantity and are used by the local population for jellies, as pie fillings, and jams. They contain 86.9% water, 6.56% sugar, composed of 0.94% saccharose, 2.78% glucose, and 3.47% fructose (Vemer).

3. *V. myrtillus* L. Sp. pl. (1753) 349; Ldb. Fl. Ross. II, 902; Mat. Fl. Kavk. IV, 1, 41; Fl. Az. Ross. 9, 67; Boiss. Fl. or. III, 964; Grossg. 38 Fl. Kavk. III, 203; Kryl. Fl. Zap. Sib. IV, 2120. — *Myrtillus niger* Gilib. Fl. lithuan. I (1781) 4. — Ic.: Vol'f and Palib. Der. i kust. 307; Fl. Sib. i Dal'n. Vost. III, 121.

Shrub with sharply angled glabrous branchlets, 15-40 cm tall; leaves deciduous, light green, turning red in fall, thin, ovate or elliptic, obtuse or acute with a soft mucro, rounded or slightly cordate at base, 10-28 mm long, 6-18 mm broad, finely serrate-dentate, covered on both sides with scattered hairs, the petiole 1-1.5 mm long; flowers solitary at the base of young branchlets, nodding, the pedicels 2.5-3.5 mm long; calyx with an almost entire limb; corolla greenish-pink, urceolate-globose, 3-4.5 mm long, 4- or 5-lobed; stamens 8-10, the glabrous filaments dilated at base; anthers with 2 long appendages; berry globose, black, with a blue bloom, 6-8 mm in diameter, with reddish pulp, juice with dyestuff properties. Fl. May-June; fr. July-September.

Pine woods, mixed fir and spruce, stone pine, mixed broadleaf and coniferous, and birch woods; also tundra-alpine and polar-arctic regions. — Arctic: Arc. Eur. and Sib.; European part: throughout to Bl. and L. Don. Caucasus: Cisc., Dag., W. and S. Transc.; W. Siberia: all regions; E. Siberia: Yen., Lena-Kol. (upper reaches of Lena R.), Ang.-Say., Dau. **Gen. distr.:** Scand., Centr. and Atl. Eur., W. Med., Bal.-As. Min., Arm.-Kurd., Mong. (N.), N. Am. Described from N. Europe. Type in London.

Note. A white-berried form was described by Dumortier (f. *leucocarpum* Dum. Fl. Belg. 1827, 53), but much earlier Academician J. G. Gmelin had observed, in the course of his Siberian travels, white berries of *V. myrtillus* (Gmel. Fl. sib. III (1768) 137). De Candolle (DC. Prodr. VII (1839) 573) distinguishes two forms of white-berried whortleberry. Regel (Tr. prikl. bot. 7, 2, 107; 9, 3, 91) reports that in 1892 peasants from Raivola [Roshchino] supplied N. I. Kuznetsov with dried berries of a greenish color, and V. O. Grimm observed in the course of several years, beginning with 1913, on a morainic layer of sand and rubble in a park near Lake Vel'e in the Novgorod Region, whortleberry shrubs bearing white, slightly greenish berries covered with dark hairs. These berries did not differ in shape or size from the ordinary black berries, but the leaves were paler. Turchanov noted in 1832 "In alpinis Dahurici" var. *alpinum* Turcz. — a plant with small orbicular leaves. Apparently the same form was collected in 1926 by E. G. Bobrov in Bashkiria (Tamyan-Kataisk district, Dvoinishi in the high mountain area). This is a very small plant, with small orbicular leaves, which he named var. *nanum* Bobr. Finally, Khoroshkov recorded in 1908 and 1910, on the upper slopes of Lake Glubokii gully near Tobolsk, a distinct ecological form — var. *turfosum* Choroschk.

- 99 The tasty whortleberries are widely used both fresh and dried. The juice of the berries is used for dyeing wine, mixed with alum it is used as a violet dye, and mixed with copper sulfate, lime, and ammonium chloride, as a bright-red dye for wool and canvas. The berries contain 5-6% invertase, 1% free acids, 0.86% pectic substances and protein, as well as myrtillin which, under the action of acids, yields a dye identical to that produced by grapes. Jelly prepared from the berries is used for treatment of gastric ailments. The flowers are nectariferous and yield tasty and aromatic honey.

4. **V. ovalifolium** Smith in Rees. Cycl. 36, 2 (1819); Hook. Fl. bor.-amer. II, 33, tab. 127; Ldb. Fl. Ross. II, 903; Maxim. Prim. Fl. amur. (1859) 187; A. Gray, Fl. N. Amer. II, 24; Fl. As. Ross. 9, 73; Fl. Sib. i Dal'n. Vost. III, 116.—V. Chamissonis Bongard. in Mem. Akad. Sc. Petersb. II (1833) 151; Sugawara, III, Fl. of Saghal. IV, 1509.—Ic.: Fl. Sib. i Dal'n. Vost. III, 116.

A shrub 1.5-3 m tall; branches spreading, angled as in *V. myrtillus*, with light-brown bark, grayish on young branchlets; leaves oblong or rounded-ovate, 20-47 mm long and 12-25 mm broad, slightly pointed at apex, at first thin membranous, becoming coriaceous, on petioles 1-2 mm long, entire or with small teeth terminating in glandular cilia, the veins sparsely hairy; flowers nodding, in leaf axils at the ends of branches, appearing early together with leaves, the pedicels 4-5 mm long with reddish bracts; calyx 5-toothed, the teeth short and broad; corolla yellowish-green, oblong-ovaloid, 4-6 mm long, 5-lobed; stamens 10, the filaments glabrous except for a few hairs at base; anthers with long subulate appendages; style often exserted; berry globose, bluish-gray, 4-5 mm in diameter, crowned by the calyx. Fl. May-June; fr. August-September.

Coniferous woods on mountain slopes, sometimes in swampy lowlands.—Far. East: Uss., Kamch. (Komandorskie Is.), Sakhalin (Kunashir Is.).

Gen. distr.: Japan, Ber. (Aleutian Is.), N. Am. (from Alaska to Oregon, Lake Superior, Michigan, and Quebec). Described from North America. Type in London.

Note. *V. ovalifolium* is a Japano-American species, in vicarious relationship to the boreal *V. myrtillus*. In *V. ovalifolium* the corolla is oblong and filaments sometimes bear a few hairs at base, while in *V. myrtillus* the corolla is urceolate-globose and the filaments are always glabrous.

100 **Economic importance.** The berries are edible, resembling whortleberry in taste. They are gathered for industrial use, as they contain the same dyestuff as whortleberry.

5. **V. praestans** Lamb. in Trans. Linn. Soc. X (1811) 264; DC. Prodr. VII, 2, 574; Ldb. Fl. Ross. II, 904; Maxim. Prim. fl. amur. 187; Fl. Az. Ross. 9, 74; Fl. Sib. i Dal'n. Vost. III, 123; Kom. Fl. Kamch. III, 14; Sugawara, III, Fl. of Saghal. IV, 1542.—Ic.: Maxim. Prim. fl. Amur. tab. VIII; Fl. Sib. i Dal'n. Vost. III, 124; Sugawara, l.c. tab. 692.

A small subshrub; caudex almost horizontally decumbent in the moss; branches up to 8 cm long, ascending, with yellowish-gray bark; leaves gathered at the end of sterile branchlets, usually 3, obovate, obtuse or acute, 20-60 mm long and 25-35 mm broad, cuneately tapering into a petiole 4-10 mm long, deciduous, thin, minutely serrulate, mucronate, hairy on the veins beneath; fertile branchlets bearing a single obovate leaf 20-25 mm long and 10-15 mm broad and a cluster of 2 or 3 flowers on hairy pedicels bearing 2 minute bracteoles; calyx with 4 or 5 broadly triangular ciliate teeth; corolla pale yellow, campanulate, 4-6 mm long, 4- or 5-lobed; stamens 8-10, the filaments broad, the anthers furnished with short inconspicuous appendages, the pollen-sacs very variable, either very short and thick or rather long and slender; style stout, shorter than the stamens; berry large, 8-10 mm in diameter, globose, bright green, topped by the persistent calyx-teeth and style. Fl. June-July; fr. August-September.

Mossy bogs, swampy woods, often on rotting fallen tree trunks; also elevated places and slopes; low scrub. — Far East: Uss., Sakh. (S., Urup Is.), Kamch. (S.). **Gen. distr.:** N. Japan. Described from Japan. Type in London.

Note. There are very conflicting reports concerning the use of the berries for food.

Section 3. **VITIS IDAEA** Koch, Synops. fl. Germ. et Helv. (1837) 474; A. Gray, Chl. Bor. Amer. I, 53; Benth. et Hook. Gen. pl. II, 574. — Corolla campanulate, 4-lobed; filaments of stamens hairy; anthers unappendaged; berry 4-locular, dark red; leaves coriaceous, persistent.

6. *V. vitis idaea* L. Sp. pl. (1753) 351; Pall. Fl. Ross. I, 46; Ldb. Fl. Ross. II, 901; Turcz. Fl. baic.-dahur. II, 1; Boiss. Fl. or. III, 965; Mat. Fl. Kavk. IV, 1, 43; Fl. Az. Ross. 9, 75; Fl. Sib. i Dal'n. Vost. III, 126; Grossg. Fl. Kavk. III, 202; Kryl. Fl. Zap. Sib. IX, 2118. — Ic.: Fl. Sib. i Dal'n. Vost. III, 1301.

A subshrub, from 2.5 to 25 cm tall; branchlets terete, white-hairy; leaves coriaceous, wintering, elliptic or obovate, obtuse or emarginate, slightly denticulate or entire, revolute, 5-27 mm long, 3-12 mm broad, borne on pubescent peduncles 0.5-3 mm long, dark green above, pale and dotted with dark-brown glands beneath, flowers on short pubescent reddish pedicels in a terminal short but dense 2-8-flowered clusters on the preceding year's branchlets, with a faint but pleasant scent; calyx 4-toothed, with short rounded reddish teeth, 0.75-1.25 mm long and 0.75-1 mm broad; corolla campanulate, pale pink, 4-6.5 mm long, 4-lobed; stamens 8 with hairy filaments; anthers unappendaged; style exserted; ovary 4-locular; berry subglobose, ripening dark red, edible. Fl. May-June; fr. August-September.

Coniferous and mixed woods, rhododendron thickets, balds up to the alpine zone in mountains, in the North in tundra, and on sandy mounds. — Arctic: Chuk., An.; European part: all regions except Bes., Bl., L. Don, and L. V.; Caucasus: W. Cauc., Dag., E. Cauc. (infrequent); W. Siberia: U. Tob., Ob, Irt., Alt.; E. Siberia: Ang.-Say., Dau., Yen., Lena-Kol.; Far East: Kamch. (Komandorskie Is.), Okh., Uda, Ze.-Bu., Uss., Sakh. (Kurile Is.). **Gen. distr.:** Scand., Atl. Eur., Bal.-As. Min., Mong. (N.), Korea, Manchuria, N. Am. Described from Europe. Type in London.

Note. *V. vitis idaea* varies greatly in size and number of flowers and in corolla color.

The following two ecological races are clearly distinguishable.

var. *genuinum* Herd. in Tr. Bot. Sada, I (1872) 312. — Ic.: Vol'f. and Palib. Der. i kust. 304; Fl. Sib. i Dal'n. Vost. III, 130, a, d;

A subshrub 10-25 cm tall; leaves obovate or elliptic, 11-27 mm long and 6-12 mm broad, the petiole 1.5-3 mm long; racemes 4-8-flowered; corolla 4.5-6.5 mm long, pale pink.

A form widely distributed through the forest zone.

var. *pumilum* Hornem. Oec. pl. II (1821-1837) 177. — *V. vitis idaea* var. *microphyllum* Herd. in Tr. Bot. Sada I (1872) 313. — Ic.: Fl. Sib. i Dal'n. Vost. III, 130, b, c.

A small subshrub 2.5-7 cm tall; leaves small, elliptic to suborbicular, the petiole not exceeding 0.5-1.5 mm; raceme 1-2-4-flowered; corolla 4-5 mm long, bright pink or almost red.

Occurring in the Arctic zone.— in lichen, stony, or mottled tundra, on peat mounds, sandy spots, and also on balds.

102 **Economic importance.** The palatable cowberries have long been in use in fresh state, soaked, or boiled; in earlier times they were also made into a domestic beverage, "cranberry water". As commercial products they are made into a dry powder for jelly making and occasionally as filling for caramel sweets. Cranberry has the following composition: sugar 8.57-11.8%, free acids 2.2%, benzoic acid 0.075%, tannins 0.224% (Vemer). The benzoic acid accounts for the inhibition of fermentation. This acid is present in the berries in free state as well as in the form of the glycoside vaccinin, a compound of benzoic acid and glucose. The leaves contain 5-7% abrutin and 0.5-6% flavanol (Voroshilov). Cranberry is a good honey plant although, in this respect, it is inferior to whortleberry. It is of apicultural value in that it also flowers when spring temperatures are low.

7. **V. arctostaphylos** L. Sp. pl. (1753) 351; DC. Prodr. VII, 567; Ldb. Fl. Ross. II, 901; Boiss. Fl. or. III, 964; Medv. Dr. i kust. Kavk. 191; Grossg. Fl. Kavk. III, 203.— Exs.: GRF, No. 468.

A tall shrub or a small tree, up to 2-3 m tall, with terete branches; leaves alternate, large, 6-8 cm long, oblong to elongate-oblong, narrowed at both ends, sometimes strongly tapering upward, serrulate, paler beneath; flowers in a loose few-flowered raceme, long-pedicel, in the axils of small ovate leafy bracts; calyx with broad rounded teeth; corolla large, 6 mm long, reddish-white, campanulate-cylindric, with 5 short broadly triangular lobes; stamens with hairy filaments, the anthers unappendaged; style sometimes slightly exserted; berry large, globose, black. Fl. June-July; fr. July-August.

Mountain slopes, fir- and-spruce and fir-and-beech woods, rhododendron thickets, occasionally oak forests; near the timberline in stands of birch and occasionally of pine; sometimes forming extensive thickets.— Caucasus: Cisc., W. and S. Transc., Tal. **Gen. distr.:** Bal. - As. Min. Described from Cappadocia*. Type in Leningrad.

Note. Various authors (A. Gray, Bentham and Hooker, Drude) have referred this species to different sections; the majority are, however, inclined to place it in the section *Vitis idaea* because of the hairy filaments, unappendaged anthers, and short racemes. As regards the deciduous leaves, *V. arctostaphylos* closely resembles the section *Euvaccinium*.

Economic importance. The fruit is edible and resembles that of whortleberry.

103

Genus 1112. **OXYCOCCUS** ** ADANS.

Adans. Fam. pl. II (1763) 164.— *Vaccinium* subgen. *Oxycoccus* Drude in Engl.—Pr. Pflanzenf. IV, 1 (1897) 51.— *Vacc.* sect. *Oxycoccus* Hook. Fl. bor.-amer. II (1840) 34.

Calyx 4-angled; corolla deeply 4-parted, with upturned petals; anthers unappendaged; fruit a red 4-loculed berry. Creeping, rarely erect, subshrubs with coriaceous or membranous leaves.

* [E. Central Asiatic Turkey.]

** From Greek *oxys* = sour, and *coccus* = berry.

1. Pedicels slightly pubescent; bracts inserted above the middle of the pedicel; berries large, 10-18 mm in diameter; leaves 8-16 mm long and 3-6 mm broad 1. *O. quadripetalus* Gilib.
- + Pedicels glabrous; bracts inserted below the middle of the pedicel; berries small, 5-10 mm in diameter; leaves 3-7.5 mm long and 1-1.5 mm broad 2. *O. microcarpus* Turcz.

1. *O. quadripetalus* Gilib. Fl. lithuan. I (1782) 5; Kryl. Fl. Zap. Sib. IV, 2123; Sugawara, Ill. Fl. of Saghal. IV, 1499. — *O. palustris* Pers. Syn. pl. I (1805) 419; Ldb. Fl. ross. II, 905; Kom. Fl. Kamch. III, 17. — *O. oxycoccus* (L.) Mac.-M. in Bull. Torr. Bot. Club. 19 (1892) 15; Britt. a. Brown, Ill. fl. N.U. St. II, 581. — *Vaccinium oxycoccus* L. Sp. pl. (1753) 351, ex p.; Fl. Az. Ross. 6, 64; Fl. Sib. i Dal'n. Vost. III, 99. — *Schollera oxycoccus* Roth. Fl. germ. I (1788) 170. — Ic.: Fl. Az. Ross. 9, 64, Fig. 25; Fl. Sib. i Dal'n. Vost. III, Tab. 104, b, c, d, e, f, g.

An evergreen creeping subshrub, the slender shoots up to 75 cm long; leaves coriaceous, on short petiole to 1 mm long, ovate to oblong-ovate, 8-16 mm long and 3-6 mm broad, revolute, acute, dark green and lustrous above, glaucescent with a waxy bloom; flowers 2-4 rarely 6 in a terminal umbellate inflorescence on the preceding year's branches; pedicels in the axils of scalelike bracts, 15-45 mm long, one-flowered, drooping, puberulent, with two minute linear bracts about the middle; calyx with 4 rounded sepals 0.5-0.7 mm long and 0.7-1 mm broad, ciliate-margined; corolla very deeply 4-parted, with upturned pinkish-red petals, 4-7 mm long; stamens 8, densely framed by hairs, the anthers minutely warted; style slightly exceeding the stamens, both style and stamens exserted; berry dark red, juicy, globose, oblong-ovoid, or occasionally pyriform. Fl. May-July; fr. August-September.

Forming sizable stands in sphagnum bogs. — European part: in all regions north of N. part of U. Dns., M. D., V.-Don, Transv.; W. Siberia: all regions; E. Siberia: all regions; Far East: Kamch., Sakh. **Gen. distr.:** Scand., Centr. and Atl. Eur., N. China, N. Japan, N. Am. Described from Lithuania. Type in Paris.

Economic importance. Berries are widely used in industry for jams, for pickling with cabbage, and for the production of sweets, liqueurs, berry extract, and jelly powder.

The berries contain citric acid; benzoic acid content is much lower than in cranberry. There are three kinds of sugar: glucose, fructose, and saccharose, the amount of saccharose being very small (0.22%). The content of nitrogenous compounds is very low — 0.32% (Tserevitinov).

Fresh berries contain 10 mg% of vitamin C. Berries gathered in early spring from snow-covered plants do not contain vitamins.

2. *O. microcarpus* Turcz. ex Rupr. in Beitr. z Pflanzenk. Russ. Reich. IV (1845) 56; Kom. Kamch. III, 18; Kryl. Fl. Zap. Sib. IX, 2124. — *O. palustris* Pers. β . pusillus Dunal in DC. Prodr. VII (1839) 577. — *O. pusillus* Nakai in Tokyo Bot. Mag. XXXI (1917) 577. — *Vaccinium microcarpum* Schmalh. in Tr. SPb obshch. estestv. II (1871) 149; Fl. Az. Ross. 9, 66; Fl. Sib. i Dal'n. Vost. III, 102. — *V. oxycoccus* var. *microcarpum* (Turcz.) Fedtsch. et Fler. Fl. Evp. Rossii (1910) 728. — Ic.: Fl. Az. Ross. 9, Fig. 26; Fl. Sib. i Dal'n. Vost. III, 104, a, f.

A spreading evergreen subshrub, with slender filiform shoots; leaves coriaceous, oblong-ovate, 3-7.5 mm long and 1-2.5 mm broad, acute, revolute and thus appearing even narrower, dark green above, glaucous beneath with waxy bloom; flowers smaller than in *O. quadripetalus*, on slender glabrous pedicels bearing minute linear bracts below the middle; calyx-lobes 4, rounded, with glabrous or short-ciliate margins; corolla 4-parted, pinkish-red, 3-5 mm long and 1-1.5 mm broad; berry not exceeding 5-10 mm in diameter.

Peat bogs, often together with *O. quadripetalus*, and in stony tundra, but it penetrates farther north, and in Asia farther south, than *O. quadripetalus*.—Arctic: Arc. Eur. and Sib.; European part: Kar.-Lap., Lad.-Ilm., Dv.-Pech., V.-Kama, Transv., U. Dnp. (sphagnum bogs of Orsha, Minsk, and Rogachev); W. Siberia: all regions; E. Siberia: all regions; Far East: Kamch. (S.), Sakhal. **Gen. distr.:** Arc., Scand., Korea. Described from the vicinity of Leningrad. Type in Leningrad.

Note. Not used for food because of the small size of the berries.

105 Family CXXV. **DIAPENSIACEAE** LINDL.*

Flowers regular, bisexual, with calyx and corolla; calyx 5-parted, persistent; corolla 5-parted to the middle, deciduous; stamens 5, the dialated filaments adnate to corolla and alternate with its lobes; anthers bilocular, opening by longitudinal slits; ovary superior, 3-locular, many-ovuled, the placentation axilar; style with a capitate 3-lobed stigma; fruit a 3-locular loculicidal 3-valved capsule; seeds numerous, with a straight or slightly curved embryo surrounded by abundant fleshy endosperm.

Genus 1113. **DIAPENSIA** ** L.

L. Sp. pl. (1753) 141.

Calyx 5-parted, persistent, 2- or 3-bracted at base; corolla campanulate; white, 5-lobed to the middle or lower down, deciduous; stamens 5, with divergent locules; ovary 5-locular, with a filiform style and a capitate entire or slightly 3-lobed stigma. Small shrubs with evergreen thickish stiff entire leaves.

The genus contains 5 species distributed through the Arctic zone and the high-mountain belt of Eurasia (2 species) and the Himalayas (3 species).

Section 1. **LAPPONICAE** Edgar Evans in Notes from the Royal Botanic Garden, Edinburgh, XV (1925).—Flowering pedicels 1-1.5 cm long; staminoids wanting.

Note. This is the only section represented in the USSR. The three species occurring in the Himalayas belong to the section *Himalaicae* (flowers subsessile; staminoids normally present).

* Prepared by B. K. Shishkin.

** From Greek *diapensos*; *dia* = through, and *penso* = pain, due to its being used in treatment of wounds. The ancient Greeks used the name *diapense* for a different plant, *Salicula europaea*. It is not known why Linnaeus applied this name to a plant of the order *Ericales*.

1. Compactly pulvinate plants; leaves oblong-linear, 8-17 mm long and 1-2 mm broad, with only the midvein visible, dark green in fall. 1. *D. lapponica* L.
- 106 + Loosely caespitose plants; leaves obovate, 3-8 mm long and 2-3 mm broad, with several lateral veins visible beside the midvein, turning red in fall. 2. *D. obovata* (Fr. Schmidt) Nakai.

1. *D. lapponica* L. Sp. pl. I (1753) 141; Ldb. Fl. Ross. III, 85, ex p.; Kryl. Fl. Zap. Sib. IX, 2125. — *D. lapponica* var. *genuina* E. Busch in Fl. Sib. i Dalpn. Vost. IV, 3. — *D. japonica* (sphalm.) F. Gmel. Syst. (1788-1793) 1539. — *D. obtusifolia* Salisb. Parad. Lond. II, 1 (1807) tab. 104. — Ic.: Fedch. i Fler. Fl. Evrop. Rossii, III, Fig. 614.

A strongly branched rather compactly pulvinate shrub, 4-8 cm tall and 5-12 cm across, glabrous throughout; leaves numerous, oblong-linear, entire, scarcely revolute, subfalcately recurved, usually canaliculate above, bluntly carinate on the paler lower side, 8-12 mm long, 1-2 mm broad; flowers solitary, terminal; pedicels 1.5-3 cm long, with 2-3 bracts below the calyx; the bracts ovate to oblong-ovate, obtuse, 4-5 mm long, the lowest somewhat remote; calyx lobes obovate or elliptic, obtuse, minutely serrulate at apex, sometimes emarginate, 6-7 mm long and 3-4 mm broad; corolla white, ca. 10 mm long, the lobes obtuse, rounded-obovate, ca. 5 mm long and broad; filaments flattened, linearly slightly dilated at base, 2 mm long and 1 mm broad; style 4-5 mm long; capsule trigonous-ovoid, 4 mm long and 3 mm broad; seeds angular, finely granular, 0.5 mm across. June-July.

Slopes, sandy banks, stony taluses; lichen, moss-and-lichen, and stony tundra. — Arctic: Arc. Eur., Arc. Sib. (eastward to the Ob); European part: Kar.-Lap., V.-Kama (Centr. Urals). **Gen. distr.:** Scand., Iceland, Greenland, Hudson Bay, Labrador. Described from the mountains of Lapland. Type in London.

2. *D. obovata* (Fr. Schmidt) Nakai, Trees a. shrubs Jap. ed. 1, I (1922) 194; ed. rev. I (1927) 269. — *D. lapponica* var. *obovata* Fr. Schmidt, Reise Amurl. u. Sachal. (1868) 161; E. Buschin Fl. Sib. i Dal'n. Vost. IV, 3; Hulten, Fl. Kamtch. IV, 46. — *D. lapponica* var. *asiatica* Herd. in Tr. Bot. Sada, I (1872) 488, sine descript.; Miyabe, Fl. Kurile, 248. — *D. lapponica* Ldb. III, 85, pro minima parte; Kom. Fl. Kamch. III, 18, non L. — Ic.: Nakai, l.c. (1922) Fig. 194; id. (1927) Fig. 269.

- 107 A low spreading shrub, forming loose tufts 2-5 cm tall, glabrous throughout, turning red after flowering; leaves numerous, obovate, cuneately narrowed toward base, revolute, sometimes barely falcately recurved, usually canaliculate above, bluntly carinate on the paler lower side, 3-8 mm long, 2-3 mm broad in distal part; flowers solitary, terminal; pedicels 1.5-3 cm long, elongating in fruit to 4-5 cm, with 2 or 3 bracts below the calyx, the bracts ovate, obtuse, 4-5 mm long, the lowest somewhat remote, often accompanied by 1-3 distant oblong bractlike leaves; calyx-lobes elliptic, 4-5 mm long and 2-3 mm broad, obtuse; corolla white, ca. 10 mm long, the lobes obtuse, rounded-obovate, ca. 5 mm long and broad; filaments flattened, linear, 2 mm long and ca. 1 mm broad; style up to 5 mm long; capsule subglobose, ca. 3 mm long and as broad; seeds angular, small, ca. 0.4 mm long. Fl. June-July; fr. August-September.

Stony and stony-sandy summits of balds; lichen and moss mountain tundra. — Arctic: Arc. Sib. (east of Yenisei R.), An., Chuk.; E. Siberia: Lena-Kol., Dau. (N.); Far East: Ze.-Bu., Uss. (Sikhote-Alin Range), Uda (N.), Sakh., Okh., Kamch. Gen. distr.: Ber., Japan. Described from Sakhalin. Type in Leningrad.

Order 32. **Primulales** Lindl.

Flowers 5-merous (rarely 4- or 8-merous) with stamens opposite corolla lobes, inserted in the tube or at the throat, sometimes with staminoids opposite the calyx-lobes, bisexual, actinomorphic, rarely zygomorphic, sometimes dimorphic in the same species due to heterostyly; lobes of calyx and corolla rarely distinct, mostly more or less connate; corolla occasionally wanting; carpels as many as perianth members, facing the calyx-lobes; ovary superior or half-inferior, unilocular, one- or more often many-ovuled; placentation basal central; embryo small surrounded by abundant albumen.

In addition to the families represented in our flora, the order Primulales contains two tropical families — Theophrastaceae and Myrsinaceae.

Family **MYRSINACEAE** LINDL.

Myrsine centaureorum Ung. in Tertiary layers of W. Transc. (Goderzi). — *M. doryphora* Ung. in the Eocene of U. Dnp. (Mogil'no), in the Oligocene of the Burdigala stage of Transv. (Siddikmullina), in the Eocene of the Paltava stage of V.-Don (Tim, Molotychi); in the Tertiary of W. Transc. (Goderzi); in the Eocene of U. Tob. (S. Urals, Baki); in the Middle Miocene layers of Cisc. (Temnolesskaya). — *M. eucalyptifolia* Stanisl. in the Eocene Buchak layers of U. Dnp. (Valyanshchina). — *M. spatulata* Palib. in the Tertiary layers of W. Transc. (Goderzi).

Genus **ARDISIA**

The occurrence of the genus *Ardisia* in the USSR is highly provisory. *Ardisia* cf. *oceanica* in the Mediterranean layers of Dagestan (Kemah).

Family CXXVI. **PRIMULACEAE** VENT. *

Flowers solitary or gathered in paniculate, racemose, or umbellate inflorescences bracteate or involucrate at umbel base, actinomorphic or very rarely zygomorphic, often dimorphic by heterostyly; calyx persistent; corolla gamopetalous, with a rather long tube and a more or less distinct limb of 5, rarely 4-7 imbricated lobes, sometimes rotate; stamens 5, inserted in tube or mouth of corolla, fully included or exerted, opposite the corolla lobes, free or monadelphous, sometimes alternating with staminoids, tooth-shaped or scalelike ones alternate with corolla lobes

* Prepared by An. A. Fedorov, who also drew up the characteristics of tribes.

and facing the sepals, often wanting; ovary superior, rarely half-inferior, unilocular, the placenta free-basal, usually thickened, sometimes raised on a gynophore; style simple, with an inconspicuous capitate stigma; ovules numerous, with two integuments; fruit a variously dehiscent, sometimes circumscissile, commonly many-seeded capsule; seeds angular, with a small straight embryo surrounded by albumen. Perennial, annual or monocarpic herbs, rarely suffrutescent plants (foreign genera). Leaves simple, all basal or some cauline and then alternate, opposite, or verticillate, entire, lobed, dentate or pinnately dissected; stems simple or branched, the plants often scapose, or the flowers subradical; underground organs various, including roots, rhizomes, and tubers.

The family Primulaceae is distributed chiefly through the mountainous regions in the north of the temperate zone, rarely in the tropics and in the southern hemisphere. The family contains 29 genera and about 800 species.

The classification of the family Primulaceae in Engler's universal system was originally presented by Pax (Engl. -Pr. Pflanzenf.) and was then published again, with some modifications, "Genera syphonog." in the conspectus by Dalla Tore et Harms. This classification is much sounder than the one presented in the last editions of Engler's "Syllabus d. Pflanzenf." (1936) which was based on the monograph by Pax and Knuth (Pflanzenf). The inclusion of the genus *Dodecatheon* to the tribe Androsaceae (i.e. Primuleae) in the last two publications is clearly inappropriate. In this case, the flower shape is surely more important for the systematics of genera than the presence of tubers. Pax and Knuth, entirely divorce *Dodecatheon* from the closely related genus *Cyclamen* almost solely on account of the presence of tubers in species of *Cyclamen*. Thus, upon withdrawal of *Dodecatheon*, the characterization of the tribe Cyclamineae has been formulated (in the Syllabus) in a most unconvincing manner: "Knollenpflanzen; Blüten ähnlich denen der Dodecatheoninae mit zurückgebogenen Kronenabschnitten". Having referred *Dodecatheon* to the tribe Androsaceae (= Primuleae), Pax and Knuth had to establish a special subtribe for this genus — a quite unnecessary procedure if this genus is incorporated in the tribe Cyclamineae, as indeed appropriately proposed by Pax himself in the earlier version of his system. We supplement the systematics of the family by establishing the new tribe Glauceae for the genus *Glaux* which differs conspicuously from other genera of Primulaceae in the absence of corolla and in various other characters.

1. Plants with spherical or somewhat flattened tubers; leaves all basal, long-petioled, cordate at base; flowers solitary, the long scape coiling in fruit; corolla with strongly reflexed lobes. . . . 1130. **Cyclamen** L.
- + Plants without tubers, with root or rhizome of various shape; leaves exclusively rosulate or partly cauline, sometimes in whorls; flowers and inflorescence various 2.
2. Corolla lobes strongly reflexed, oblong-linear, narrow; calyx teeth reflexed in flower, becoming erect in fruit; small plants with a short oblique rhizome, ovate-oblong petiolate leaves, the leafless scape bearing a few-flowered inflorescence, flowers purple. 1131. **Dodecatheon** L.
3. Corolla lobes bent forward or curved, but not reflexed. 3.
- + Aquatic plants, with pinnately dissected leaves; flowers in racemes raised above the water; corolla rotate 1121. **Hottonia** L.

- + Terrestrial plants; leaves entire or toothed or lobed, but not pinnately dissected 4.
4. Ovary adnate at base to calyx; leaves rosulate or cauline, borne chiefly on the lower part of the stem; flowers in a raceme, rather small, white 1122. **Samolus** L.
- + Ovary free, superior 5.
5. Leaves exclusively rosulate 6.
- + Leaves cauline. 12.
6. Corolla 5-parted, the lobes entire, bilobate or slightly emarginate. 7.
- + Corolla lobes laciniate-lacerate, often narrowly linear; small plants with a leafless few-flowered scape and rounded-reniform imbricated leaves 1120. **Soldanella** L.
7. Corolla tube very short, constricted at the throat; stamens not exerted; scalelike stamnoids present opposite the calyx-lobes; style short, included; capsule globose; plants usually small, with rosulate leaves, often compactly cespitose or pulvinate. . 1118. **Androsace** L.
- + Corolla tube elongated or short, and if somewhat constricted at throat then very long; style and anthers sometimes exerted; capsule shape various. 8.
8. Filaments connate in a ring 9.
- + Filaments distinct, very short 10.
9. Corolla campanulate, purplish-violet; anthers small, included in the flower, inserted on a thin membranous ring formed by the connate filaments at the corolla base 1119. **Cortusa** L.
- + Corolla campanulate or with spreading lobes, yellow; anthers large, commonly exerted; filaments connate into a thick exerted ring. 1116. **Kaufmannia** Rgl.
10. Corolla cylindric, deeply parted into erect elongate and slightly emarginate lobes; inflorescence umbellate, many-flowered; leaves long-petioled, broadly ovate, irregularly toothed. 1115. **Sredinskya** (Stein.) Fed.
- + Corolla with a distinct tube and a flat or funnelform limb 11.
11. Corolla tube very long, sometimes curved, enlarged at the throat and with a slight constriction below the limb; flowers sessile or short-pedicelled; mostly pulvinate or columnar plants, with small leaves; capsule dehiscent with 5 lobes from top to base 1117. **Dionysia** Fenzl.
- + Corolla tube long or short, straight; limb flat or funnelform; constriction below the limb none or very inconspicuous; flowers in umbellate inflorescences on leafless scapes or subradical peduncles; leaves rosulate; plants very rarely pulvinate. . . 1114. **Primula** L.
12. Corolla wanting; calyx pink, corollalike; flowers small, sessile, axillary; leaves opposite, covered with scattered brown dots; small plants of saline soils and seacoasts 1127. **Glaux** L.
- + Corolla developed, white or colored; calyx green, herbaceous. . 13.
13. Corolla 7-lobed, rotate, white or faintly pinkish; leaves spirally arranged, below the inflorescence verticillate and large. 1125. **Trientalis** L.
- + Corolla 5- or 4-parted, and if 6- or 7-parted then flowers yellow. 14.
14. Capsule circumscissile 15.

- + Capsule dehiscent longitudinally 16.
- 15. Corolla exceeding the calyx, 5-parted; stamens attached at the base of corolla 1128. *Anagallis* L.
- + Corolla shorter than the calyx, 4- or 5-parted; stamens inserted at the throat 1129. *Centunculus* L.
- 16. Corolla small, much shorter than the calyx 1126. *Asterolinon* Hoffmsg. et Link.
- + Corolla large, exceeding the calyx 17.
- 17. Flowers in dense clusters; corolla 6- or 7-lobed; toothlike staminoids present between the lobes of corolla . . . 1124. *Naumburgia* Moench.
- + Flowers axillary or in clusters; corolla 5-lobed 1123. *Lysimachia* L.

Tribe 1. **PRIMULEAE** Rchb. Fl. Germ. exsc. (1832) 398. — Corolla lobes entire or bilobulate and occasionally also finely toothed at the margin; capsule dehiscent with valves from the tip; corolla lobes cruciate in bud; ovary superior; plants with rosulate leaves and leafless scapes.

Genus 1114. **PRIMULA** * L.**

L. Sp. pl. ed. I (1753) 205; Pax in Engl. Pflanzenz., IV, 237 (1905) 17; W.W. Sm. and Fletcher in Trans. Bot. Soc. Edinb. XXXIII, 2 (1941) 122.

Calyx tubular, campanulate or funnellform, persistent, rather deeply 112 lobed; corolla tube distinct and usually fairly long, somewhat enlarged at the mouth; corolla limb flat or funnellform, very rarely subcampanulate, the lobes entire or bifid; stamens inserted in the throat, the filaments very short, the anthers obtuse; ovary superior, globose or ovoid; style filiform, with a capitate stigma. Many species display heterostyly, the style in long-styled flowers usually equaling the tube and in short-styled flowers half as long as the tube; ovules numerous, usually amphitropous; on a free central placenta; capsule globose or cylindric, many-seeded, 5-10-lobed; seeds dorsally flattened, convex ventrally, commonly angular; embryo transverse. Perennial herbs, rarely monocarpic plants. Leaves exclusively rosulate, entire or spatulate, petioled or sessile; flowers in umbellate or subglobose inflorescences in whorls (proliferated umbels), rarely solitary (on subradical peduncles when scape undeveloped); bracts usually narrow, lanceolate, sometimes gibbous or saccate.

About 500 species, distributed throughout the world, but chiefly in the temperate zones and in the alpine (altitude) zone of mountains.

The most ancient representatives of the genus *Primula* L. occur in the mountains of subtropical Asia, tropical Africa, and the Sinai Peninsula. The species concerned belong to the subgenus *Sphondylia* (Duby) Rupr.: *P. floribunda* Wall. (Himalayas, Afghanistan), *P. Aucheri* Jaub. et Spach, *P. verticillata* Forsk. (S. Arabia), *P. simensis* Hochst. (Ethiopia), *P. Boveana* Dcne (Sinai), *P. Lacey Hemsl. et Watt.* (Baluchistan). These species have essentially a stem and verticillate

* A diminutive of Latin *prima* = first. The name *Primula* was applied by Linnaeus to this genus, probably in view of the fact that most species flower in early spring.

** Prepared by An. A. Fedorov.

inflorescences with little-reduced involucre bracts. Ecologically, they are petrophytes of the forest zone. In the USSR, the most remarkable and probably ancient (Tertiary) species is *P. megaseifolia* Boiss. which grows in the Colchian forest near Batumi. Most characteristic for the USSR flora is the vast section *Aleuritia* Duby which includes species widely distributed through the alpine zone of the Caucasus, Soviet Central Asia, Siberia, and also in the Arctic and on plains in the forest belt. The species of this section were mainly formed in high mountains; they appear to be most recent and they are differentiated into a large number of closely related races.

The systematics of the genus *Primula* L. has been rather thoroughly studied. The first to appear was the now almost completely obsolete monograph by Léman, published in 1817, which does not yet contain any classification. Noteworthy among the classifications proposed in the post-Linnaean period is the system of Luby ("*Botanicon gallicum*" and also in De Candolle's "*Prodromus*") which divides the genus *Primula* into five sections. Further, the system of Schott (stipulating two subgenera and 113 6 sections), that of Kaminskii (four unnamed sections), and of van Tieghem and De Leeuw (seven sections based on anatomical characters). An interesting but, unfortunately, insufficiently elaborated classification was proposed by F.I. Ruprecht. Most widely used at present is the system of the German botanist Pax. Pax actually wrote two monographs on the genus *Primula*, published in 1889 and 1905, respectively; the first version written by himself alone; a later one, in cooperation with the botanist Knuth, as part of a general treatment of *Primulaceae* for Engler's edition of "*Das Pflanzenreich*". Pax's system, was employed with some modifications, for the arrangement of descriptions in the more recent monograph by the English botanists W. Wright Smith and Fletcher, although the arrangement within the sections is alphabetical (the work appeared in installments in three journals). In our opinion, Pax's system is by no means the most perfect. For instance, Pax's classification of *Primula* disregards the perfectly natural subgenera established by his predecessors. We therefore construct our system on the basis of classifications proposed by Luby, Schott, and Ruprecht, while retaining the names of subdivisions as required by the law of priority. We endeavor to express relationships between the species of *Primulaceae* represented in the flora of the USSR by establishing series, as visualized by V. L. Komarov, and also by means of certain corrections in sectional classification.

Of great value to horticulturists are the studies of Balfour which contain good descriptions of cultivated primroses but a very confused classification.

Russian botanists have not written any complete monograph on primroses, but they have produced a number of extremely valuable studies on the systematics of this genus. Of particular importance are the monographlike reviews, e.g., on the primroses of the Caucasus by N.I. Kuznetsov (*Mater. dlya Fl. Kavk.*, 1901); of Siberia, by E. A. Busch (*Fl. Sib. i Dal'n. Vost.*, 1925); of Soviet Central Asia, by S.I. Turkevich (*Fl. Az. Ross.* (1923)) and the earlier studies of F.I. Ruprecht (1863), E. Regel (1874), and R. E. Trautvetter (1866). Much work on the systematics of primroses has been done more recently by A.S. Lozina-Lozinskaya.

Species of the genus *Primula* L., side by side with roses, hyacinths, tulips, and other popular horticultural plants are among the most widespread and most beautiful plants of our gardens, greenhouses, and living rooms. Primroses have been cultivated for a very long time. The most widely grown horticultural species are: *P. obconica* Hance (China), *P. sinensis* Lindl. (China), *P. floribunda* Wall. (Himalayas), *P. vulgaris* Huds. (S. Europe, Caucasus), *P. veris* L. (Europe), *P. denticulata* Smith (Himalayas), and *P. auricula* L. (Europe).

- Among the primroses of our flora, those already grown in botanical gardens and deserving to be much more widely cultivated as ornamental plants are *P. megaseifolia* Boiss., *P. Bayerni* Rupr.,
 114 *P. ossetica* Kusn., *P. Kusnetzovii* Fed., *P. Eugeniae* Fed.,
P. turkestanica (Rgl.) E.A. White, *P. fistulosa* Turkev.,
P. Fedtschenkoi Rgl., *P. Pallasii* Lehm., and some others.

Recent studies indicate that some primroses, such as *P. macrocalyx* Bge., are a potential source of vitamin C, as they contain a considerable amount of this vitamin in their leaves.

1. Leaves involute, firmly coriaceous, cuneate, conspicuously serrate toward the apex; calyx-teeth broadly rounded, glandular-pubescent at the throat; very small, compactly cespitose plants; rootstock stout, strong, branched; occurring only in the Carpathians 67. *P. minima* L.
- + Leaves revolute (sometimes initially involute becoming revolute — section *Crystallophlomis* Rupr.), membranous, rarely firm and coriaceous, rugose of plane, spatulate, dentate, serrate, or entire, abruptly narrowed or gradually tapering into the petiole; calyx cylindric or campanulate, with acute or obtuse but not rounded lobes; corolla not glandular-pubescent at the throat. 2.
2. Corolla lobes entire or scarcely emarginate 3.
- + Corolla lobes deeply bilobed. 13.
3. Calyx rounded-cupuliform, small, very short, 1/4-1/3 the length of corolla tube; capsule globose, as long as the calyx; corolla dark purplish-violet; leaf rosettes surrounded at base by broad light-brown scales (reduced leaves); leaves oblong-obovate, denticulate 56. *P. Fedtschenkoi* Rgl.
- + Calyx cylindric or elongate-cupuliform, somewhat shorter than to equaling the corolla tube; capsule oblong or oblong-cylindric, markedly exserted or up to twice the length of the calyx; corolla purple, whitish, white, or pinkish-stramineous; scales at rosette base hyaline-fibrillose or wanting; leaves entire or toothed. . . . 4.
4. Plants small, sometimes minute, usually not more than 10 cm tall; inflorescences loosely few-flowered; flowers violet or whitish-violet; white, farinaceous bloom confined to inflorescence; rootstock short, undeveloped 5.
- + Plants large, strong, and if small then densely white-farinose; inflorescences commonly dense and many-flowered; yellow- or white-farinose or almost naked plants 7.
- 115 5. Pedicels rather long and slender in flower, 2-3 times the length of the involucre, commonly white-farinose; calyx campanulate, loosely surrounding the narrower corolla tube; leaf blade tapering into a distinct petiole; flowers rather small, commonly violet or pale violet; corolla limb not more than 0.7 cm in diameter 64. *P. tschuktschorum* Kjellm.

- + Flowering pedicels shorter than to barely exceeding the involucre; calyx cupuliform, adhering to corolla tube; leaf blades tapering into an indistinct short-winged petiole; flowers usually large, the limb up to 1.7 cm in diameter 6.
- 6. Calyx violet-black; minute plants, not more than 10 cm tall; leaves not more than 5 cm long and not more than 1 cm broad; flowers commonly 1-3 (5) 65. *P. arctica* Koidzumi.
- + Calyx greenish-white or green, finely striped along the nerves, but not violet-black; leaves longer and fairly broad, up to 10 by 2.5 cm; flowers in a compact often one-sided umbel, up to 10 or rarely more. 66. *P. eximia* Greene.
- 7. Leaves entire or minutely and obscurely serrulate, often involute, elongate-lanceolate. 8.
- + Leaves dentate or crenate, broadly lanceolate, not involute. 9.
- 8. Plants covered with a yellow or grayish-yellow waxy bloom; leaves subacute, up to 2-2.5 cm broad; corolla tube covered inside with a yellow waxy bloom, dark. 60. *P. xanthobasis* Fed.
- + Plants practically naked or faintly white-farinoso on the pedicels and inside the calyx; leaves narrowly lanceolate, longer, not more than 1.5 cm broad; calyx greenish or violet-black 62. *P. moorkroftiana* Wall.
- 9. Plants white-farinoso throughout; calyx densely white-farinoso; leaves oblong-lanceolate, obtuse to subacute, the margins above and the lower surface white-farinoso; inflorescence few-flowered; flowers pale pink. 63. *P. pulverea* Fed.
- + Plants only partly-white- or yellowish-farinoso or almost naked; calyx naked outside, greenish or blackish-violet; leaves almost naked or white-farinoso only on the toothed margin; inflorescence usually many-flowered, often verticillate; flowers pinkish-white or purplish-violet 10.
- 10. Plants practically naked; calyx greenish or bluish-green leaves quite bare, finely crenate-dentate. 59. *P. nivalis* Pall.
- 116 + Plants conspicuously white- or yellowish-farinoso on the leaves or more particularly on the pedicels 11.
- 11. Flowers pinkish-white or stramineous; calyx pale greenish; leaves crenate-dentate, the margin densely coated with yellowish-white mealy wax 57. *P. bayerni* Rupr.
- + Flowers purple or violet 12.
- 12. Calyx green; leaves obscurely crenulate, green, the margin and the lower surface sparsely yellowish-farinoso; pedicels naked 58. *P. longipes* Freyn et Sint.
- + Calyx violet-black; leaves diffusely violet-spotted or violet-centered on the midrib beneath, sharply denticulate, white-waxy on the margin; pedicels densely white-farinoso 61. *P. turkestanica* (Rgl.) E.A. White.
- 13. Leaves oboval-cuneate, petiolate, dentate toward apex, elsewhere entire, rather small; a very small plant, not more than 10 cm tall; flowers up to 2 cm in diameter, purple or rose; inflorescence few-flowered; occurring in the eastern sector of the Arctic, in Kamchatka, and along the Okhotsk coast 55. *P. cuneifolia* Ldb.
- + Leaves entire or dentate throughout. 14.
- 14. Involucral bracts auriculate-saccate at base, never reflexed; seeds pointed at both ends 15.

- + Involucral bracts not saccate, sometimes slightly gibbous at base; seeds ovaloid, subglobose or angular. 20.
- 15. Flowering scapes very short, the inflorescence often not exceeding the leaves, the scapes elongating in fruit but not becoming more than 15 cm long; leaves sharply serrate or spinulose-serrate, in compact rosettes; inflorescence loosely few-flowered; flowers large, up to 1.5-2 cm across, pink 49. **P. Warshenewskiana** B. Fedtsch.
- + Flowering scapes commonly long, exceeding the leaves, elongating in fruit up to 30-40 cm 16.
- 16. Leaves slenderly long-petioled, oblong-obovate, sharply sinuate-dentate; scapes slender, flexuous; inflorescence loosely few-flowered; base of rosette surrounded by brown reticulate-fibrillose remnants of dead leaves 54. **P. flexuosa** Turkev.
- + Leaves short petioled or sessile, serrate or almost entire; scapes erect, often rather stout; inflorescence a compact, subcapitate or dense spherical umbel; base of rosettes without reticulate-fibrillose leaf remnants 17.
- 117 17. Flowers lemon-yellow, the throat orange; strong naked plants up to 40-70 cm tall, the stout scapes up to 0.7 cm thick at base; leaves lance-elliptic, sharply and doubly dentate. 51. **P. luteola** Rupr.
- + Flowers purplish-violet or bluish; shorter plants, not exceeding 40 cm, sometimes elongating in fruit up to 60 cm; leaves serrate or crenate-dentate or obscurely serrate, neither sharply dentate nor entire 18.
- 18. Inflorescence a large, many-flowered, often spherical umbel, with rather long pedicels; leaves distinctly crenate-dentate, broad, up to 3 cm broad; scapes fairly stout 50. **P. auriculata** Lam.
- + Inflorescence small, many- or few-flowered, compact, with short pedicels; leaves nearly entire, not more than 1.5-2 cm broad; scapes fairly slender 19.
- 19. Flowering scapes short, usually not exceeding 10-15 cm, becoming 2-3 times as long in fruit; leaves commonly not more than 5-10 cm long; plants of Soviet Central Asia 52. **P. Olgae** Rgl.
- + Flowering scapes usually 15-20-30 cm long, not more than twice as long in fruit; leaves narrow, 15-20 cm long; plants of S. Transcaucasia and N. Iran. 53. **P. Tournefortii** Rupr.
- 20. Calyx terete, not angled at the nerves 21.
- + Calyx distinctly angled 46.
- 21. Leaves deeply lobed or slightly but distinctly so, orbicular or shortly ovoid-oblong, abruptly contracted into a slender narrowly winged or nearly wingless petiole; plants not farinose 22.
- + Leaves sometimes lobed, lanceolate or oblong, gradually tapering into the petiole, or orbicular and distinctly petiolate, or with a very small orbicular or rhomboid blade; plants often white- or yellow-farinose, sometimes very densely so. 28.
- 22. Leaves rounded-reniform, deeply 5-7-lobed, the lobes coarsely crenate-dentate, the petiole slender, long, narrowly winged; pubescence sparse or more or less dense. 23.
- + Leaves short-ovate or oblong-ovate, cordate at base, short-lobed and dentate, the short petiole and the blade densely pubescent. 27.
- 23. Flowers bright or pale yellow, large, up to 2 cm across; leaves glabrous above, the petiole several times as long as the blade 1. **P. Eugeniae** Fed.

- 118 + Flowers white with a dark-violet tube or purplish-violet; leaf petiole
 24. equaling twice the length of the blade 24.
 24. Corolla white, the tube dark violet; involucre bracts spatulate-
 lanceolate; calyx prominently nerved. 2. **P. lactiflora** Turkev.
 + Corolla purplish-violet 25.
 25. Calyx densely papillose; leaf base and scape furnished with whitish
 scalelike reduced leaves; flowers rather small, up to 1.3 cm across;
 corolla reddish-violet, with a yellow throat
 3. **P. drosocalyx** P. Pol. et Lincz.
 + Calyx hairy or glabrous, but not papillose 26.
 26. Scares but slightly exceeding the leaves; small plants, not more than
 15 cm tall; leaves not more than 3.5 cm across, the blade broadly
 ovate or almost square, entire or tridentate, obtuse; scape (excluding
 the inflorescence) not exceeding 7 cm, commonly one-flowered, rarely
 2-flowered 5. **P. Minkwitziae** W.W. Sm.
 + Scares markedly exceeding the leaves, often 2-3 times as long; often
 large plants, up to 30 cm tall; leaves up to 5-7 cm across, the blade
 triangular in outline, 5-7-dentate, the teeth blunt or acutish;
 inflorescence many-flowered, often verticillate.
 4. **P. Kaufmanniana** Rgl.
 27. Calyx teeth strongly recurved; capsule subglobose, shorter than to
 equaling the calyx. 7. **P. patens** Turcz.
 + Calyx teeth erect, not recurved; capsule oblong, about twice the
 length of calyx 6. **P. cortusoides** L.
 28. Corolla tube long, mostly about 3 times the length of calyx; corolla
 dark violet throughout; leaves densely yellowish-farinose beneath;
 scapes stoutish; pedicels shorter than calyx; capsule equaling or
 exceeding the calyx; occurring in the USSR only in the Carpathians.
 48. **P. halleri** J. F. Gmel.
 + Corolla tube mostly only 1 1/2-2 times the length of or equaling the
 calyx, greenish or whitish, rarely violet, the limb violet-rose; leaves
 farinose or glabrous 29.
 29. Involucre bracts reflexed, especially in mature fruit; capsule oblong,
 as long as the calyx; inflorescence compact, with short pedicels
 32. **P. algida** Ad.
 + Involucre leaves not reflexed 30.
 30. Both corolla tube and limb violet, but the color of tube more intense,
 the tube twice as long as the calyx; inflorescence compact; pedicels
 very short; leaves serrate, slightly or very densely white-farinose.
 33. **P. baldshuanica** B. Fedtsch.
 + Calyx tube always paler than the limb, whitish or greenish 31.
 31. Leaves small, rhomboidally spatulate, abruptly tapering into the
 petiole, glabrate or glandular-farinose 32.
 + Leaves oblong-ovate, lanceolate or rounded-ovate, gradually or more
 or less abruptly tapering into the petiole, farinose or naked 33.
 32. Plants almost entirely devoid of farinaceous bloom; leaves cuneately
 obovate or spatulately rhomboid, dentate or nearly entire; scape
 commonly purple-tinged, 1-8 (12) cm long; involucre bracts slightly
 sacculate at base 41. **P. borealis** Duby.
 + Plants yellowish-farinose, especially on the lower surface of the
 rhomboid-cuneate leaves; involucre bracts not appendaged and not
 enlarged at base; small plants, not more than 12 cm tall
 42. **P. Matsumurae** Petitm.

33. Involucral bracts distinctly auriculate; leaf blade small, rounded-elliptic, abruptly or gradually tapering into the petiole, like the plants as a whole not farinose; calyx more or less densely dotted with black glands 34.
- + Involucral bracts not distinctly auriculate; leaves lanceolate or oblong-ovate, rather gradually tapering into the petiole, naked or farinose; calyx not dotted with black glands, green or violet 38.
34. Scapes stoutish, firm 35.
- + Scapes slender, sometimes subfiliform 36.
35. Leaves firm, rather thick, somewhat coriaceous, subspatulate; rosettes dense; inflorescence densely many-flowered; involucral bracts densely dotted with black glands; corolla large, up to 2 cm across, violet or pink 47. *P. pamirica* Fed.
- + Leaves rather thin; corolla very small, white, orange at the throat. 46. *P. Knorringiana* Fed.
36. Limb of corolla 3-4 (5) mm in diameter; scapes slender, often subfiliform; inflorescence many-flowered; leaves spatulate 45. *P. Iljinskii* Fed.
- + Limb of corolla 1-1.3 (1.5) cm in diameter; leaf blade suborbicular; rather abruptly narrowed into the petiole, thin; pedicels often nodding. 37.
- 120 37. Calyx equaling the corolla tube 44. *P. finmarchica* Jacq.
- + Calyx half the length of corolla tube 43. *P. sibirica* Jacq.
38. Involucral bracts subtriangular, short, fleshy, gathered in large number at the base of pedicels, hence the long stout tubular scapes club-shaped at apex; inflorescence a large, many-flowered, spherical umbel. 40. *P. fistulosa* Turkev.
- + Involucral leaves lanceolate, thin; scapes not tubular, not club-shaped at apex. 39.
39. Pedicels slender, filiform, often flexuous; calyx very short, turbinate, parted into lanceolate teeth to below the middle 40.
- + Pedicels straight, sometimes unequal; calyx cylindric or campanulate, parted to 1/3 or to about the middle 42.
40. Flowers large, up to 1.5 cm in diameter, bright violet; corolla tube very short, about equaling the calyx; leaves obovate, subspatulate, crenulate-denticulate, slightly farinose 29. *P. ossetica* Kusn.
- + Flowers small, not more than 1 cm in diameter, rose or carmine (drying blue); corolla tube twice the length of calyx 41.
41. Bare plants; inflorescence 2-10 (15)-flowered. 30. *P. darialica* Rupr.
- + Plants white-farinose, mainly on the lower side of leaves and on the calyx; inflorescence containing up to 30 flowers 31. *P. farinifolia* Rupr.
42. Plants almost devoid of farinaceous bloom 43.
- + Plants strongly whitish- or yellow-farinose, especially on the lower leaf surface 45.
43. Flowering pedicels barely exceeding the involucre; inflorescence 1-5 (8)-flowered; calyx turbinate-campanulate, white-farinose between the teeth; occurring only in the western sector of the Arctic. 39. *P. stricta* Hornem.
- + Flowering pedicels greatly exceeding the involucre; calyx bare . . . 44.

44. Leaves obovate or spatulate, to subrhomboid, tapering into a distinct petiole, often dentate or nearly entire, not more than 2-5 (7) cm long; a small plant, not more than 20 cm tall in flower. 36. *P. gigantea* Jacq.
- + Leaves oblong-elliptic, gradually narrowed into a petiole or subsessile, up to 10 cm long; scapes firm, rather stout, up to 30 cm long in flower, elongating in fruit to 45 cm 38. *P. longiscapa* Ldb.
- + Leaves spinulose-dentate, subpinnatifid, 1.5 mm long; scapes slender, not more than 3-8 cm long in fruit; inflorescence few-flowered 37. *P. pinnata* M. Pop. et Fed.
45. Leaves oblong-lanceolate, finely or obscurely denticulate, whitish- or yellowish-farinose, gradually tapering into the petiole; capsule barely exceeding 1 1/2 times the length of calyx 34. *P. farinosa* L.
- + Leaves cuneately spatulate-oblong, rather abruptly narrowed into the long petiole, the lower side densely yellow-farinose, the margin erose-dentate; capsule 2-3 times the length of calyx 35. *P. sachalinensis* Nakai.
46. Leaves very thin, flat, coarsely crenate-dentate, rounded-reniform, quite glabrous, with a long slender nearly wingless petiole; flowers solitary, large, bright rose, the pedicels about as long as the leaves. 8. *P. Juliae* Kuzn.
- + Leaves strongly rugose, abruptly narrowed or gradually tapering into the petiole, or firmly coriaceous, suborbicular, large, or regularly reniform and tomentose beneath 47.
47. Capsule with reflexed pointed lobes; leaves regularly orbicular-reniform, plane 48.
- + Capsule with straight lobes only slightly reflexed at apex; leaves strongly rugose 49.
48. Leaves orbicular or nearly so, large, firmly coriaceous, spinose-dentate, long-petioled; leaf petioles and scapes covered with brown scarious hairs; flowers large, up to 2 cm across, rose; inflorescence umbellate or consisting of 2 approximate whorls; capsule slightly exceeding the calyx 9. *P. megaseifolia* Boiss. et Bal.
- + Leaves rather small, regularly reniform, irregularly and obscurely crenulate-denticulate, whitish-tomentose beneath; scapes 1-3-flowered; capsule equaling the calyx 10. *P. renifolia* Volg.
49. Scapes none; pedicels long, arising from rosette base 50.
- + Scapes well developed; inflorescence umbellate. 55.
50. Rootstock giving rise to several distinct rosettes; flowers white, fragrant 12. *P. komarovii* A. Los.
- + Rosette mostly single; flowers not fragrant 51.
- 122 51. Leaves densely and compactly white-tomentose beneath; flowers rose, white, bluish, or yellow 16. *P. heterochroma* Stapf.
- + Leaves with scattered pubescence or with sparse tomentum or almost glabrous beneath 52.
52. Flowers dark purple, the throat yellow with a brown stripe 15. *P. abchasica* D. Sosn.
- + Flowers rose, yellow, or whitish 53.
53. Flowers yellow 11. *P. vulgaris* Huds.
- + Flowers rose or whitish 54.
54. Flowering pedicels markedly shorter than the leaves; flowers rosy, drying blue, the rather long corolla tube exceeding the calyx 14. *P. Woronowii* A. Los.

- + Flowering pedicels much shorter than the leaves; flowers rose or whitish, the corolla tube barely exceeding the calyx. 13. *P. Sibthorpii* Hoffmssg.
55. Flowers rose or purple. 56.
- + Flowers yellow. 58.
56. Leaves gradually tapering into the petiole, long-cuneate at base, oblong-obovate, finely crenulate-denticulate. . . . 17. *P. amoena* M. B.
- + Leaves abruptly passing into the petiole, the base cordate, straight or obcuneate. 57.
57. Leaves glabrate on both sides, dentate or somewhat lobate-dentate. 18. *P. Meyeri* Rupr.
- + Leaves densely grayish- or whitish-tomentose beneath, distinctly lobate-dentate or undulate. 19. *P. Kusnetzovii* Fed.
58. Limb of corolla incurved, the tube much longer than the diameter of the limb; inflorescence one-sided. 59.
- + Limb of corolla flat, its diameter about equaling or greater than the length of the tube; inflorescence not secund. 60.
59. Calyx narrowly cylindric in flower, accrescent in fruit; leaves abruptly passing into the petiole, short-elliptic; capsule as long as the calyx. 20. *P. veris* L.
- + Calyx campanulately inflated in flowers; leaves gradually tapering into the petiole, oblong-ovate; capsule about half as long as the calyx. 21. *P. macrocalyx* Bge.
60. Leaves gradually tapering into the petiole, long-cuneate at base. . . 61.
- + Leaves abruptly passing into the petiole, the base cordate, truncate, or short-cuneate. 63.
- 123 61. Leaves gray-tomentose beneath, revolute; corolla tube barely exceeding the calyx. 22. *P. Ruprechtii* Kusn.
- + Leaves almost glabrous or with scattered hairs on the veins; corolla tube 1/3 as long again to about twice as long as the calyx. 62.
62. Leaves with scattered short hairs confined to the lower side or almost glabrous, irregularly denticulate or erose-denticulate; scapes glabrate; calyx about half as long as corolla tube. 23. *P. Pallasii* Lehm.
- + Leaves and scapes rather densely covered with long and somewhat spreading hairs, finely crenulate-denticulate; calyx about 2/3 the length of corolla tube. 24. *P. poloninensis* (Domin) Fed.
63. Leaves grayish beneath due to a dense coat of short stiff hairs, the broad blade cordate or truncate at base; calyx glandular-pubescent, strongly accrescent in fruit, with subfalcately reflexed teeth. 28. *P. pseudoelator* Kuzn.
- + Leaves slightly tomentose or glabrate beneath, not covered with short stiff hairs; calyx devoid of glandular hairs. 64.
64. Flowers lemon-colored, large, up to 2.5 cm across, with a short and broad tube; leaves broad, the glabrate blade cordate at base; calyx cylindric, parted to the middle into straight lanceolate teeth, glabrate; plants to the high-mountain zone of the Caucasus. 27. *P. cordifolia* Rupr.
- + Flowers sulfur-yellow; leaves short-cuneate at base. 65.
65. Leaves glaucescent-puberulent beneath; scapes covered with spreading long hairs; capsule about half the length of calyx. 26. *P. carpathica* (Griseb. et Schenk) Fuss.

- + Leaves covered beneath with scattered hairs or almost glabrous; scapes slightly pubescent; capsule as long as the calyx. 25. *P. elatior* (L.) Hill.

Subgenus 1. **PRIMULASTRUM** (Duby) Schott in Sipp. d. österr.

Prim. (1851) 10, emend; Rupr. in Bull. Acad. Sc. Petersb. VI (1863) 218.—*Primulastrum* Duby in DC. Bot. Gall. I (1828) 383, pro sect.—Leaves with revolute vernation, membranous, often rugose; calyx tubular-cylindric or campanulate; capsule mostly conspicuously exserted from calyx; inflorescence commonly many-flowered, umbellate; corolla glabrous at throat, crinkled; plants usually with a long oblique or a short vertical rootstock, with a 124 perennial root, or monocarpic, completely destitute of farinaceous bloom or leaves farinose, glabrous or pubescent.

Section 1, **CORTUSOIDES** Balf. f. in Journ. Roy. Hort. Soc. London, XXXIX (1913). 139.—Leaves rounded-reniform or short-ovate, cordate at base, abruptly passing into a long petiole, deeply lobed or lobate-dentate; capsule short, equaling or slightly exceeding the calyx; calyx tubular or cylindric, with erect or reflexed teeth, little accrescent in fruit; corolla with a long tube and a flat or subinfundibular limb. More or less pubescent plants, not farinose.

Section type: *P. cortusoides* L.

Series 1. **Kaufmannianae** Fed.—Leaves rounded-cordate, long-petioled, deeply 5-7-lobed, the lobes coarsely dentate; flowers yellow, white, or purplish-violet.

1. *P. Eugeniae* Fed. in Bot. zhurn. SSSR, XXXIII, 1 (1948) 31; W.W. Sm. and Fletch. in Trans. Bot. Soc. Edinb. XXXV, 2, 183.—*P. Kaufmanniana* Rgl. f. *albiflora* B. Fedtsch. Fl. Az. Ross. I, 1 (1923) 12 (nomen).—Ic.: Fed. l.c. Tab. II.

Perennial, cespitose from a multicapital rootstock topped by numerous remnants of dead leaves; leaves with long or very long petioles, reniform or subcordate, distinctly lobed, glabrate above, puberulent mainly on the veins beneath, abruptly passing into a long slender narrowly winged pubescent petiole, the leaf lobes obtuse 3-5-toothed or crenate, the petiole several times the length of blade; scapes about 1 1/2 times as long as the leaves; inflorescence umbellate, glabrous; pedicels unequal, 2-5 times the length of involucre; involucral bracts 4-6, broadly lanceolate, acute, unequal; flowers ca. 15-20 mm long; calyx glabrous, campanulate, 5-parted down to or below the middle, the acutish lobes somewhat papillose at apex; corolla pale yellow, 3 times as long as the calyx, the flat limb up to 20 mm across, the lobes with 2 rounded lobules; corolla tube cylindric, more or less enlarged and more intensely colored at throat; anthers yellow, inserted at the throat; trigonous, the filaments very short, conical; ovary globose; style filiform, glabrous, with a capitate stigma; heterostyly pronounced; seeds brown. August (Plate IV, Figure 2).

Crevice of marmoreal rocks in the alpine and nival zones at an altitude of about 4000 m. Soviet Central Asia: Tien Shan (Fergana Range). Endemic. Described from Mt. Baubash-Ata. Type in Leningrad.

125 **Note.** Originally we related this species to *P. septemloba* Franchet, but we now agree with the opinion of Wright Smith and Fletcher who record this species in a supplement to their monograph and correctly point out the closer affinity to *P. Kaufmanniana* and *P. lactiflora*. However, apart from very clear differences between *P. Eugeniae* and these species, *P. Eugeniae* also differs ecologically, being a chasmophyte of the alpine and nival zones and also in having a distinct distribution area confined to the western part of the Fergana Range.

2. *P. lactiflora* Turkev. in Bot. Mat. Gerb. Glavn. Bot. Sada, II, 4 (1921) 13; Fl. Az. Ross., ser. I, 1, 12; W.W. Sm. and Fletch. in Trans. Bot. Soc. Edinb. XXXIV, 1, 69.

Perennial; rootstock short, oblique; plants more or less pubescent; leaves rounded-ovate, cordate at base, the blade usually longer than broad, lobed (the lobes coarsely and irregularly dentate), dark green and almost glabrous or diffusely hairy above, pale and slightly hairy on the veins beneath; petiole slender, narrowly winged, as long as to twice the length of the blade, more or less covered with curly hairs; stipe slender, usually exceeding the leaves, rather densely hairy especially in lower part; inflorescence umbellate or consisting of two approximate whorls; pedicels 2-5-10, from 8 to 20 mm long, slender, glabrous, those of the lower whorl relatively longer; involucre bracts spatulate-lanceolate, acutish, much shorter than the pedicels; calyx tubular, parted to 1/3 into lanceolate prominently nerved teeth; corolla with a milky-white limb 6-16 mm in diameter, the tube narrow, dark violet, somewhat enlarged at throat, 2-2 1/2 times the length of calyx; corolla lobes obcordate, emarginate, with rounded lobules; capsule ovaloid-cylindric, exceeding the calyx. May-June.

The higher levels of the forest zone, in sparse juniper woods. — Soviet Central Asia: Pamir-Alai (Tadzhikistan, S. Kirghizia). Endemic. Described from Zeravshan Range. Type in Leningrad.

Economic importance. An ornamental plant.

3. *P. drosocalyx* P. Pol. et Lincz. in Bot. Mat. Gerb. Bot. inst. AN SSSR, XII (1950) 10.

126 Perennial; rootstock branched, with rather thin light-brown roots, the leaves and scapes furnished at base with oblong obtuse whitish-hyaline scales 1-1.5 cm long and 0.5-0.6 mm broad; leaves small, the blades up to 1.5-2 cm broad, the petioles 4-7 cm long; blade rounded-reniform, parted to 1/4 into 7-10 round finely and obtusely dentate lobes, covered with short often papillary hairs; petioles whitish, furrowed, almost wingless, rather sparsely covered with short hairs, buried up to the blade in the substrate and hence somewhat etiolated; scapes about twice the length of leaves, slender, papillose-puberulent; involucre bracts, few, obovate, obtusish, yellowish-green, 3-5 mm long, 1-1.5 mm broad, papillose; umbel 2-6-flowered; pedicels unequal, shorter to somewhat longer than the involucre, papillose; calyx campanulate, dissected to 1/3 into triangular-ovate acutish teeth, densely papillose; corolla reddish-violet, yellow at throat, the narrow glandular-hairy tube twice the length of calyx, the flat limb to 1.3 cm across the lobes broad, notched, obcordate, apparently rose-violet in live condition. July.

Gravelly taluses in the alpine zone. — Soviet Central Asia: Tien Shan (Talass Ala Tau). Endemic. Described from Ul'kun-Kaindy Pass. Type in Leningrad.



1. *Primula Kaufmanniana* Rgl. 2. *P. Eugeniae* Fed. 3. *P. cortusoides* L. 4. *Juliae* Kuhn. 5. *P. patens* Turcz.

4. *P. Kaufmanniana* Rgl. in Tr. Bot. Sada, II, 1 (1874) 131; in Byull. Obshch. lyubit. estestvozn. antrop. i etnogr. XXI, 4; Trautv. in Tr. Bot. Sada, IX, 6; Pax in Engl. Bot. Jahrb. X, 169; id. in Engl. Pflanzenr. IV, 237, 28; Fedch. O. and B. Perech. rast. Turk. V, 2; Turkev. in Fl. Az. Ross, I, 1, 11; W.W. Sm. and Fletch. in Trans. Bot. Soc. Edinb. XXXIV, 1, 67. — *P. cortusoides* Herd. in Bull. Soc. Nat. Mosc. I (1869) 60, non L. — *P. Kaufmanii* Rgl. in Bull. Soc. Nat. Mosc. (1878) 185. — *P. lactiflora* Schipcz. (non Turkev.) var. *lactea* Schipcz. et var. *lacticortusoides* Schipcz. in Bot. Mat. Gerb. Gl. Bot. Sada, II, 24-25 (1921) 99; Turkev. l.c. 13. — Ic.: Regel', l.c. (1876) tab. 4; Kesselring in Gartenfl. LXXXVI, 270.

Perennial; rootstocks short, giving rise to numerous rather slender fibrous roots; leaves rounded-cordate to subreniform, 4-7 cm long and 3-8 cm broad, lobed, the lobes secondarily dissected into triangular and somewhat elongate irregularly and subacutely or obtusely toothed segments, the upper surface dark green, smooth or covered with few isolated hairs, the lower surface rather densely hairy chiefly on the veins; petioles slender, narrowly winged, beset with long hairs 2-3 times as long as the blade; scape long, mostly exceeding the leaves, pubescent; inflorescence 129 umbellate or consisting of 2 approximate whorls; involucre bracts linear-lanceolate, acute, entire or toothed at apex; pedicels 0.5-2 cm long, greatly exceeding the involucre, glabrous or pubescent; calyx tubular or tubular-campanulate, commonly parted to 1/3 into lanceolate acute lobes, glabrous or slightly pubescent, faintly nerved; corolla rose-violet, the narrow tube 2 1/2 times the length of calyx, the somewhat incurved limb 0.7-1.5 cm across; corolla lobes obcordate, deeply notched; capsule oblong, exceeding the calyx. July-August (Plate IV, Figure 1).

Rocks in the subalpine and upper forest zones of mountains. — Soviet Central Asia: T. Sh., Dzu.-Tarb., Pam.-Al. Endemic. Described from Dzungarian Ala Tau. Type in Leningrad.

Note. The varieties *lactea* and *lacticortusoides* described by N.V. Shipchinskii (l.c.) belong to *P. Kaufmanniana* Rgl. and not to *P. lactiflora* Turkev. The first represents typical *P. Kaufmanniana* with large corollas, which, however, become discolored on drying; the second does not differ in any way from the type.

Economic importance. An ornamental plant.

5. *P. Minkwitziae* W.W. Sm. in Not. Roy. Bot. Gard. Edinb. XVIII (1935) 181; W.W. Sm. and Fletch. in Trans. Bot. Soc. Edinb. XXXIV, 1, 104. — *Cortusa Matthioli* Podpera in Beih. Bot. Centralbl. XXXIX, 2 (1921-1923) 286, non L. — Ic.: W.W. Sm. l.c. tab. 247 (photo).

Perennial; small plants, with scapes and leaves of equal length; leaf petioles up to 5-5.5 cm long, stramineous, covered with translucent spreading (not tangled) hairs; leaf blades orbicular, 3-3.5 cm across, somewhat fleshy in drying, 7-lobed to 1/4-1/3, the lobes broadly ovate to almost square, entire or 3-dentate, obtuse or [?] fringed with whitish translucent hairs; underside of leaves sparsely hairy on the veins; scape barely reaching 7 cm, covered with hairs like those of the petioles, one-flowered (always?); involucre bracts 3-4, linear-lanceolate, acutish, 3-6 mm long, densely pubescent; calyx ca. 7 mm long, cylindric, parted to the middle into linear-lanceolate acutish lobes, green, densely hairy; corolla tube ca. 11 mm long, 2 mm broad, cylindric, rather densely covered

outside with whitish translucent hairs, dark purple on drying; corolla lobes ca. 6 mm long, narrowly obovate, (probably) purple. July.

Taluses in the alpine zone. — Soviet Central Asia: Tien Shan (Chimkent area). Endemic. Described from a single specimen from Dzhebagly Mts. in the Talass Ala Tau. Type in Vienna.

- 130 Note. Apparently, this species hardly differs from *P. Kaufmaniana* Rgl. and probably represents merely a depauperate specimen of the latter. However, the author of this species, W. Wright Smith (l.c., 182), related it to *P. alsophila* Balf. f. et Farrer and *P. palmata* Hand.-Mzt. (from the Himalayas). Later Smith and Fletcher (l.c.) actually placed the species in a separate new section *Geranioides*. New collections and observations are necessary to solve the problem.

Series 2, **Cortusifformes** Fed. — Leaves oblong-ovate, truncate or shallowly cordate at base, with numerous round crenate-dentate lobes; petioles shorter than to not more than twice the length of the blades; flowers bright purple.

6. *P. cortusoides* L. Sp. pl. (1753) 144; W.W. Sm. and Fletch. in Trans. Bot. Soc. Edinb. XXXIV, 1, 64; Lehm. Monogr. Primul. 23; Bge. in Ldb. Fl. alt. I, 208; Duby in DC. Prodr. VIII, 36; p.p.; Ldb. Fl. Ross. III, 1, 8, p.p.; Turcz. Fl. baic.-dahur. II, f. 2, 244, ex p.; Rgl. in Tr. Bot. Sada, III, 1, 129, ex p.; Herd. in Tr. Bot. Sada, I, 384; Scheutz, Pl. vascul. jennisieiens, 138; Korsh. in Mem. Acad. Sc. Petersb. VIII, 283; Kryl. Fl. Alt. III, 807; Fl. Zap. Sib. IX, 2128; Pax in Engl. Bot. Jahrb. X, 168; p.p.; Pax in Engl. Pflanzenr. IV, 237, 27; Turkev. in Fl. Az. Ross., ser. I, 1, 8; E. Buschin Fl. Sib. i Dal'n. Vost. IV, 12. — *P. cortusoides* var. *genuina* Turcz. l.c. 224. — *P. cortusoides* var. *typica* Rgl. l.c. 129. — *P. cortusoides* var. *typica* Pax, l.c. (1905) 27. — *Androsace primuloides* Moench, Meth. pl. Suppl. (1802) 152. — *Aleurita cortusoides* Spach, Hist. veg. Phaner. IX (1840) 361. — Ic.: Gmel. Fl. Sib. IV, tab. 55; Curtis Bot. Mag. (1797) tab. 399; E. Busch, l.c. 16.

Perennial; rootstock short, horizontal; plants covered with more or less tangled hairs; leaves ovate, cordate at base, the little-pronounced rounded lobes unevenly and irregularly dentate, more or less hairy; blades 3-5 (7) cm long, 2-3 (5) cm broad; petioles slender, narrowly winged, covered with long hairs, equal to 2-3 times the length of the blade; scapes slender, pubescent, much longer than the leaves; inflorescence umbellate, 3-12-flowered; involucre bracts lanceolate, acute, shorter than the pedicels; pedicels 5-15 mm long, almost glabrous or slightly hairy; calyx tubular, slightly hairy, the teeth acute or obtusish, lanceolate, erect (not reflexed), ciliolate; corolla reddish-violet, rarely white (var. *albiflora* Theod. et Fed.), the flat limb 15-20 mm across; corolla lobes obcordate, deeply notched; corolla tube exceeding the calyx; capsule oblong, about twice the length of the calyx. May-June. (Plate IV, Figure 3).

- 131 Sparse mountain woods, glades, rocky slopes, and also birch woods in the plains. — W. Siberia: Irt., Alt.; E. Siberia: Ang.-Say.; Soviet Central Asia: Dzu.-Tarb. **Gen. distr.**: Mongolia. Described from Siberia. Type in London.

Note. A white-flowered variety — var. *albiflora* Theod. et Fed. var. *nova* "floribus albis vix lutescentibus", occurs in the Sayan foothills near the village of Aginskoe.

Economic importance. A decorative plant.

7. *P. patens* Turcz. in Bull. Soc. Nat. Mosc. XI (1838) 99 (nomen); id. in Fl. baic.-dahur. II, 2 (1856) 225 (sub var. *patens* Primulae cortus.). E. Buschin Fl. Sib. i Dal'n. Vost. IV, 17; Kom. and Alis. Oprod. rast. Dal'nevost. kr. II, 847. — *P. cortusoides* var. *patens* Turcz. l.c. (1856) 225; Korzhinsk. in Tr. Bot. Sada, XII (1892) 367; Kom. Fl. Man'chzh. III, 1, 221. — *P. cortusoides* Ldb. Fl. Ross. III (1846-1851) 8, exp. p.; Maxim. Prim. Fl. amur. 192. — *P. cortusoides* var. *typica* Rgl. in Tr. Bot. Sada, III (1875) 129, exp. p. — *P. saxatilis* Pax in Engl. Pflanzenr. IV, 237 (1905) 27, non Kom. — *P. Sieboldii* Pax in Engl. l.c. 22, non K. Morren. — *P. Sieboldii* W.W. Sm. and Fletch. in Trans. Bot. Soc. Edinb. XXXIV, 1 (1944) 81, exp. p. non K. Morren. — Ic.: E. Busch, l.c. 16; Kom. and Alis. l.c. Plate 258. — Exs.: Gerb. Fl. SSSR, No. 3454.

Perennial; rootstock short, oblique, giving rise to rather slender white roots; plants more or less covered with crisp hairs; leaves ovate or oblong, cordate or truncate at base, shallowly dissected into round irregularly dentate lobes, covered with fairly long tangled hairs; blades 5-8 cm long, 2.5-4 cm broad; petiole equaling to 2-3 times or occasionally 4 times as long as the blade, slender, narrowly winged, hairy; scapes slender, exceeding the leaves, pubescent; inflorescence umbellate, 3-12-flowered; involucral bracts lanceolate, acute, shorter than the pedicels; pedicels 0.5-1.5 cm long, glabrous or slightly pubescent; calyx almost glabrous, conically enlarged, the declined lanceolate acute teeth as long as the tube; corolla reddish-violet, the flat limb 15-20 mm across; corolla tube rather short, somewhat enlarged at throat, twice as long as the calyx; corolla lobes obovate, deeply notched; capsule subglobose, shorter than or equaling the calyx. May-June. (Plate IV, Figure 5).

Meadows and scrub. — E. Siberia: Dau.; Far East: Ze.-Bu., Uda, Uss.

Gen. distr.: Manchuria, Korea, Japan. Described from Dauria. Type in Leningrad.

Economic importance. A decorative plant. The horticultural form described from Japan under the name *P. Sieboldii* E. Morren is even more attractive.

- 132 **Note.** The name of this species was proposed by N.S. Turchaninov because of the declined calyx-teeth. Hence, the accepted connotation of the epithet *patens*, spreading, is not appropriate in this case.

Section 2. JULIA Fed. et A. Los. in Addenda XVI, 723. — Calyx angled; corolla-tube twice the length of the calyx; flowers solitary, borne on subradical pedicels; scapes none; leaves reniform, cordate at base, glabrous, very thin, coarsely dentate-crenate, the petiole long and narrowly winged. — Section type: *P. Juliae* Kusn.

8. *P. Juliae* Kusn. in Tr. Bot. Sada Yur'evsk. Univ. I, 2, (1899) 67; in Mat. Fl. Kavk. IV, 1, 75; Pax in Engl. Pflanzenr. IV, 237, 56; Grossg. Fl. Kavk. III, 206; W.W. Sm. and Fletch. in Trans. Bot. Soc. Edinb. XXXIV, 4, 429. — Ic.: Curtis Bot. Mag. (1912) tab. 8468. — Exs.: Fl. cauc. exs. No. 20.

Perennial; rootstock short, oblique, giving rise to rather slender brownish roots; plants small, up to 10 cm tall, stemless, quite glabrous; leaves exclusively basal, long-petioled, together with blade up to 10 cm long; leaf blade thin, dull green, rounded-reniform or broadly ovate-

orbicular, cordate at base, 2-3 cm long and about as broad, coarsely and sometimes doubly crenate, faintly veined; petioles slender, somewhat winged, 2-3 times as long as the blade; flowers solitary, the pedicels equal to 2-3 times the length of the leaves; calyx narrowly tubular, slightly angled, the lanceolate finely pointed teeth about half the length of the tube; corolla large, rose, up to 2-3 cm across, the tube 2 cm long, twice the length of the calyx, the limb broad and flat; corolla lobes obcordate, deeply notched (to 1/3), the lobules round-tipped; fruits and seeds unknown. April (Plate IV, Figure 4).

Abundantly watered rocks in the forest zone. — Caucasus: E. Transc., Dag. (Greater Caucasus Range). Endemic. Described from Lagodekhi Gorge (Kakhetia). In addition to this classical location, found in Dagestan (Pala-Kata Gorge), and in Azerbaijan (Nukha District, Dzhabar-Eilagi, Tenish-Chaban-Baba, Kutkashen District, Damir-Aparan-Chai R. gorge). Cotype in Leningrad.

Economic importance. A very decorative plant. Cultivated successfully in the rockery of the Leningrad Botanical Garden. Flowering in May. Has been introduced into European gardens for the beautiful flowers. It appeared as early as 1911-1912 in Oxford and Kew (Surrey), and soon afterwards also in Holland. At present numerous named hybrid varieties are known, such as Dark Juliae, Lilac Juliae, Juliana, Sulphur Juliae, etc.

- 133 Section 3. **CAROLINELLA** (Hemsl.) Pax in Engl. Pflanzenr. (1905) 45.—*Carolinella* Hemsl. in Hook. Ic. pl. (1902) tab. 2726 (pro gen.).—Calyx tubular, angled, slightly accrescent in fruit and sometimes broadly cupuliform; corolla-tube at least twice the length of calyx; capsule rounded-oblong, equaling or exceeding the calyx, the valves declinate in maturity; leaves firm or coriaceous, orbicular to short-elliptic or reniform, dentate or somewhat spinulose-dentate. Plants covered with ferruginous or grayish hairs, rarely glabrous. Section type: *P. Partschiana* Pax (= *Carolinella cordifolia* Hemsl.).

9. **P. megaseifolia** Boiss. et Bal. ex Boiss. Fl. or. IV (1879) 26; Pax in Engl. Bot. Jahrb. X, 170; Fomin in Tr. Bot. Sada Yur'evsk. Univ. II, 63; Kuzn. in Mat. Fl. Kavk. IV, 57; Pax in Engl. Pflanzenr. IV, 237, 46; Grossg. Fl. Kavk. III, 206; W.W. Sm. and Fletcher in Trans. Bot. Soc. Edinb. XXXIV, 4, 432.—Ic.: Curtis Bot. Mag. (1903) tab. 7901; Mottet, Monogr. Genre Primevère (1912) tab. 4; Balfur f. in Journ. Roy. Hort. Soc. XXXIX, f. 83.—Exs.: Herb. Fl. Cauc. No. 343.

Perennial, acaulescent plants; rootstock oblique, fibrillose, with thick stringy roots; leaves large, firm, wintering, mat green above, pale and dull beneath; leaf blade broad, glabrate, broadly elliptic, rounded or cordate at base, slightly emarginate at apex, irregularly dentate or sometimes almost spinulose-dentate, or rarely nearly entire, the lower side prominently veined, faintly ferruginous-tomentulose on the midrib, 5-12 cm long excluding the petiole and 5-10 cm broad; petiole equal to twice the length of the blade, rather stout, covered throughout or merely in lower part with ferruginous subhyaline hairs; scapes shorter than or equaling the leaves; inflorescence umbellate or consisting of 2 approximate whorls; involucre bracts narrowly lanceolate from base, long-acuminate, about equal to sometimes greatly exceeding the pedicels; pedicels 7-30 mm long; calyx

134 glabrous, the long narrow glabrous subcylindric tube parted to about 1/3 into slightly reflexed teeth; corolla large, up to 2 cm across, rose (drying blue); corolla-tube narrow, almost twice as long as the calyx, passing into a somewhat enlarged and flat limb; corolla-lobes obcordate, deeply notched, with rounded lobules; capsule oblong, somewhat exceeding the calyx, dehiscing with reflexed lobes; seeds rounded-angled, minutely tubercular beneath the coat. Fl. March; fr. June (Plate V, Figure 5, a).

Beech woods, mostly with undergrowth of Pontic rhododendron. — Caucasus: W. Transc. (Batumi, Chakva). **Gen. distr.:** Asia Minor (Pontic Range). Described from Turkish Lazistan (Rize). Type in Geneva.

Note. A species endemic for the Colchian province*. A relict of Tertiary flora, with nearest relatives in E. Asia.

We have translated the epithet "megaseifolia" as "badanolistnyi" [bergenia-leaved], as the genus *Megasea* included at one time *Bergenia crassifolia*, a plant occurring in Siberia and well known to Russian botanists. The leaves of *Primula megaseifolia* do in fact closely resemble those of *bergenia*. The name "Pervotsvet megazelistnyi" [megasea-leaved primrose] would sound strange and incomprehensible [to the Russian ear].

Economic importance. A decorative plant.

10. ***P. renifolia*** Volg. in Bot. Mat. Gerb. Bot. inst. AN SSSR, VIII, 7 (1940) 111; Grossg. Oprod. rast. Kavk. (1949) 595. — Ic.: Volgunov, l. c. 112.

Perennial, small acaulescent plants; roots stoutish and somewhat fleshy, whitish, clustered; leaves exclusively basal, long-petioled; leaf blade reniform or somewhat tapering toward apex, deeply cordate at base, up to 5 cm long, dull green above, rather densely white-tomentose beneath, irregularly crenate-dentate, obscurely dentate, or almost entire, the slightly prominent veins spreading at a nearly right angle from the midrib and partly recurved; petioles rather slender, very narrowly winged, slightly tomentose, at least twice as long as the blade; scapes shorter than to slightly exceeding the leaves, slender, slightly tomentose-pubescent; inflorescence a 2- or 3-rayed umbel; involucral bracts 1-3, lanceolate, finely tomentose-pubescent; pedicels much shorter than the involucre, slender, finely tomentose-pubescent; calyx broadly ovaloid, tomentose-puberulent, whitish, dissected to 1/3, the teeth acuminate from a triangular base, somewhat hyaline-margined; corolla tube narrow, twice the length of calyx, enlarged into a flat limb, the emarginate lobes bluish-violet; capsule glabrous, stramineous, the lobes reflexed in maturity. July (Plate V, Figure 6).

Near the timberline, in rock crevices, among pines, at an altitude of 2000 m. — Caucasus: Cisc. (Main Range). Endemic. Described from Teberda R. valley in N. Caucasus, W. slopes of Mt. Kel'-Bashi. Type and cotype in Leningrad.

135 ***Note.*** Smith and Fletcher, in supplements to their monograph of the genus *Primula* (Trans. a. Proceed. Bot. Soc. Edinb. XXXV, 2 (1950) 202), do not acknowledge the independent status of *P. renifolia*, in spite of its being a readily distinguishable species in all respects. They maintain that, according to drawing and description, this plant represents a poorly developed specimen or a dwarf form of *P. megaseifolia*.

* [Colchis — an ancient country of S. Europe on Black Sea south of Caucasus Mts. corresponding to western part of the Soviet Republic of Georgia.]

The authors correctly criticize the view expressed by Volgunov (l.c.) concerning the relationship of the species to *P. Meyeri* Rupr. Still before the monograph supplements of Smith and Fletcher appeared in print, we had already established the kinship of *P. renifolia* to *P. megaseifolia*, and the view concerning the relationship as postulated in the monographs confirms the soundness of the classification adopted by us. There is no doubt that, if Smith and Fletcher had seen the original herbarium species of *P. renifolia*, they would have become convinced of the independent status of this species and its marked differences from the admittedly closely related *P. megaseifolia*.

Section 4. **EUPRIMULA** Schott, Sipp. d. österr. Prim. (1851) 10.—*Verbasculum* Rupr. in Bull. Acad. Sc. Petersb. IV (1863) 276.—*Vernales* Pax in Engl. Bot. Jahrb. X (1889) 177; id. in Engl. Pflanzenr. IV, 237, 47.—*Primulastrum* Duby in DC. Bot. Gall. I (1828) 383.—Calyx distinctly angled; seeds large, angular, minutely tubercular; leaves strongly rugose, often tomentose beneath; plants usually more or less hairy, never farinose; corolla limb flat or incurved; capsule little exerted from or included in the calyx.—Section type: *P. veris* L.

Series 1. **Acaules** Fed.—Scapes very strongly abbreviated; pedicels apparently subradical, long, slender; corolla large, with a relatively short tube and a broad limb, purple or yellow or white or of an intermediate color; flowers sometimes fragrant.

11. ***P. vulgaris*** Huds. Fl. Angl. (1762) 70; Hegi, Ill. Fl. Mittel-Eur. V, 1743; W.W. Sm. and Fletch. in Trans. a. Proceed. Bot. Soc. Edinb. XXXIV, 4, 452; Kolak. Fl. Abkh. III, 267.—*P. acaulis* (L.) Hill. Veg. Syst. VIII (1765) 25; Grossg. Fl. Kavk. III; A. Lozinsk. in Izv. AN SSSR, ser. VII, 2, 300.—*P. acaulis* Jacq. Misc. Austr. I (1778) 158; Lehm. Monogr. Primul. 30; Ldb. Fl. Ross. III, 10; E. Regel', Tr. Bot. Sada, III, 133; Boiss. Fl. or. IV, 24; Shmal'g. Fl. II, 196, p.p.; Pax in Engl. Bot. Jahrb. X (1889) 18; Kuzn. in Mat. Fl. Kavk. IV, 76; Pax in Engl. Pflanzenr. IV, 237 (1905) 54.—*P. acaulis* var. *genuina* Pax, l.c. (1889) 180; l.c. (1905) 54.—*P. veris* var. *acaulis* L. Sp. pl. ed. 1, I (1753) 143.—Ic.: Hegi, l.c. f. 2740-2742; Schelchtend. Langenth. u. Schenk, Fl. v. Deutschl. ed. 5, XIX, 1966; Rchb. Ic. Fl. Germ. XVII, 136 tab. 50, f. 2 et 3.—Exs.: Fl. cauc. exs. No. 164; GRF, No. 122; Domin et Krajina, Fl. Čechoslov. exs. No. 279.

Perennial; rootstock short, with numerous stoutish stringy brown roots; leaves rosulate, together with petiole 5-25 cm long, 2-6 cm broad; leaf blade oblanceolate or more often obovate-oblong, rounded-tipped, gradually tapering to an indistinct petiole, irregularly erose-dentate or crenate, membranous, glabrous above, more or less hairy on the veins beneath; the veins concave above, the lateral veins 8-10 pairs, convex beneath; petioles very short to rarely about equaling the blade, broadly membranous-winged; caudex none; involucre bracts at the base of rosette leaves and thus concealed, 1-1.5 cm long, linear to linear-lanceolate, tapering toward apex; pedicels 6-20 cm long, more or less hairy; calyx 1-2 cm long, tubular, angled, pubescent at angles, parted to about the middle into lanceolate acute teeth; corolla pale yellow, violet at throat, the tube

markedly enlarged at throat, the limb 2-4 cm across, the broad lobes emarginate; stamens 5; style in long-styled flowers somewhat shorter than to equaling the corolla tube; in short-styled flowers half the length of the tube; capsule ovoid, shorter than the calyx; seeds 2-2.5 mm in diameter, globose or irregularly ovoid, brown, minutely tubercular. February-April.

Deciduous forests of the South, chiefly at the wood margins, also in the alpine zone of Abkhazian mountains, in meadows, and close to melting snow.— European part: U. Dnp. (Zhitomir), Crimea; Caucasus; W. Transc. **Gen. distr.:** S. and Centr. Eur. Described from Europe. Type in London.

Note. The true (yellow-flowered) *P. vulgaris*, in its pure form, occurs in the USSR in the SW part of the Ukrainian SSR (there are collections from Zhitomir). In Crimea there is already an admixture of forms with rose-colored flowers, while in the Caucasus the yellow-flowered race extends east along the Black Sea coast of the Caucasus only as far as Sochi; it is then replaced by a race with rose-colored flowers, i.e., *P. Sibthorpii*. In the intermediate region, i.e., approximately between Sochi and Sukhumi, occurs a large number of forms of distinctly hybrid origin (crosses between *P. vulgaris* and *P. Sibthorpii*). These forms are extremely variable as regards color and size of corolla, extent of pubescence on leaves and scapes, and other characters. Attempts have recently been made to describe these forms as distinct species. Most of these forms, however, are far from stable, not to mention the absence of clearly defined distribution areas.

Economic importance. The common primrose has been introduced into cultivation as a decorative plant. It is particularly valuable as one of the earliest spring plants, coming into flower before the unfurling of leaves on the trees.

- 137 12. **P. Komarovii** A. Los. in Izv. AN SSSR, ser. VII, 2 (1938) 301; Grossg. Opred. rast. Kavk. 596.— *P. vulgaris* subsp. *Sibthorpii* (Hoffmsgg.) W.W. Sm. et Forrest in W.W. Sm. and Fletch. in Trans. Bot. Soc. Edinb. XXXIV, 4 (1948) 463, ex. p.

Perennial; rootstock giving rise to several rosettes; leaves dark green, with a distinct network of veins, sinuate-dentate, the teeth minutely spinulose; leaf blade glabrous above, densely pubescent on the veins beneath; scape none; pedicels subradical, ca. 10 cm long, erect before flowering, later nodding, rather densely covered with multicellular glandular hairs 0.8 mm long; flowers white, fragrant, up to 3.7 cm across; calyx tubular, somewhat inflated at base, 1.5 cm long, 0.5 cm across, bluntly angled, the very acute teeth reaching the limb of corolla; corolla with a rather short tube and a broad flat limb; corolla lobes deeply notched, displaying at base a yellow spot with three orange stripes. February.

Forest zone.— European part: Crimea; Caucasus: Cisc., W. Transc., Endemic. Described from cultivated specimens collected in Gelendzhik and grown in the greenhouse from rootstocks. Type in Leningrad.

Note. The most striking characters that distinguish this species from the closely related *P. vulgaris* are the aromatic flowers with calyx teeth reaching the limb of corolla. This is most probably a stable form of the hybrid cycle *P. vulgaris* × *P. Sibthorpii*.

13. **P. Sibthorpii** Hoffmseg. Verzeichniss d. Pflanzenkulturen etc. (1824) 189; Rchb. Fl. Germ. exs. I, 402; Camel in Parlatore, Fl. Ital. VIII, 610; Grossg. Fl. Kavk. III (1932) 267; Kolak. Fl. Abkh. III, 267; A. Los. in Izv. AN SSSR, ser. VII, 2, 362.—*P. rubra* (Sibth. et Smith) Dörfl. (nomen) Herb. norm. (1899) 3867.—*P. vulgaris* subsp. *Sibthorpii* (Hoffmseg.) W.W. Sm. et Forrest in Not. Roy. Bot. Gard. Edinb. XVI, 92; W.W. Sm. and Fletch. in Trans. Bot. Soc. Edinb. XXXIV, 4, 463.—*P. acaulis* var. *Sibthorpii* Pax in Engl. Bot. Jahrb. X (1889) 181; Kuzn. in Mat. Fl. Kavk. IV, 78.—*P. acaulis* var. *rubra* Sibth. et Smith, Fl. graec. II (1813) 70; Rupr. in Bull. Acad. Sc. Petersb. VI, 221; Halacsy, Consp. Fl. Graec. III, 6; Pax in Engl. Pflanzenr. IV, 237, 55.—*P. acaulis* var. *iberica* G.F. Hoffmann, Hort. Mosquens. (1808) 2594 (nomen).—*P. acaulis* var. *rosea* Boiss. Fl. or. IV (1879) 24.—*P. amoena* var. *acaulis* M.B. Fl. taur.-cauc. I (1808) 138.—*P. amoena* var. *Sibthorpii* C. Koch in Linnaea, XVII (1843) 307.—*P. grandiflora* var. *orientalis* C. Koch in sched.—Ic.: Wien Ill. Gart.-Zeit. XXVIII (1903) 151, f. 36; Sibth. et Smith, l.c. tab. 184; Bot. Mag. III (1794) tab. 229; Kolak. l.c. tab. XXIX.—Exs.: Dörfl. Herb. norm. No. 3867; Gerb. Fl. SSSR, No. 43; Fl. cauc. exs. No. 43; Fl. graeca exs. No. 330 (sub *P. acaulis*).

138 Perennial; rootstock short, with stringy brown roots; leaves obovate, strongly cuneate at base, passing into and about 3 times as long as the petiole, slightly pubescent, chiefly on the lower side and on the veins; scapes none; pedicels arising from rosette base; flowers large, up to 4 cm across, rose or stramineous; calyx tubular, angled at the nerves; corolla tube short, about equaling the calyx; capsule included in the calyx, ovoid. February-March (Plate V, Figures 2, 2a, 2c).

Deciduous woods, mostly at the margins.—Caucasus: W. and E. Transc. **Gen. distr.:** Bal.-As. Min. (Greece, Asia Minor). Described from cultivated specimens, probably grown from seeds obtained from Greece. Type probably missing. The plant described and illustrated in "Flora graeca" should be considered as the type.

Note. This plant hardly differs from *P. vulgaris* Huds., except for corolla color and the distribution area which centers in Greece, Asia Minor, and SE Transc. (see also note to description of *P. vulgaris*).

14. **P. Woronowii** A. Los. in Izv. AN SSSR, ser. VII, 2 (1933) 303; Grossg. Opred. rast. Kavk. 596.—*P. vulgaris* subsp. *Sibthorpii* (Hoffmseg.) W.W. Sm. et Forrest. in W.W. Sm. and Fletch. in Trans. Bot. Soc. Edinb. XXXIV, 4, 463, ex p.

Perennial, low plants; leaves about half the length of flowering pedicels, obovate, cuneately tapering into a short petiole, sinuate-dentate, the upper side with scattered short hairs, the lower side densely pubescent especially on the veins; scapes none; pedicels erect, 5-6 cm long, densely hairy; the hairs 1.3 mm long; involucre bracts small; flowers rose, drying bluish or white, 2.5-2.7 cm across; calyx 1.5 cm long, 0.3 cm broad, with straight acute teeth, shorter than corolla tube; corolla limb flat, the broadly obcordate lobes 1-1.3 cm long, up to 1 cm broad, with small round yellow spots at base. May.

Mountains, in their forest zone.—Caucasus: W. Transc., E. Transc. (Khosta, Telavi, Lagodekhi, Aragvi, Karabakh). Endemic. Described from Kakhetia* (Telavi). Type in Leningrad.

* [Area in E. Georgian SSR.]



Plate V

1. *Primula amoena* M. B., 1a) capsule (anterior part of calyx removed), 2. *P. Sibthorpii* Hoffm. & Thell., 2a) calyx with ripe capsule (anterior part of calyx removed), 2b) petal and pistil. 3. *P. macrocalyx* Bge., 3a) calyx (in section) with capsule. 4. *P. Pallasii* Lehm. 5. *P. megaseifolia* Boiss. et Bal., 5a) calyx with capsule. 6. *P. renifolia* Volg.

Note. A stable form of the hybrid cycle *P. vulgaris* × *P.*

Sibthorpii. Additional observations under natural conditions are needed.

- 141 15. *P. abchasica* D. Sosn. in Tr. Tbil. bot. sada, II (1937) 231.—
P. Sibthorpii var. *abchasica* (D. Sosn.) Kolak. in Fl. Abkh. III
(1948) 267.—*P. vulgaris* subsp. *Sibthorpii* W.W. Sm. et Forrest
in W.W. Sm. and Fletch. in Trans. Bot. Soc. Edinb. XXXIV, 4 (1948) 463,
ex p.—*P. Sibthorpii* Hoffmannsegg from Grossg. Opređ. rast. Kavk.
(1949) 596, ex p.

Perennial; leaves obovate-spatulate, rugose, above, gradually tapering toward base from the broadest part, pubescent on the midrib beneath, coarsely crenate and finely erose, slightly curled, minutely hairy on the veins above; scapes none; pedicels arising from rosette, up to 6 cm long; calyx puberulent, beset with stalked glandular hairs, parted to 1/3 into lanceolate acute teeth; corolla tube about 1/3 as long again as the calyx, yellow; corolla limb purple; throat with yellow spot bordered by a narrow brown stripe. April.

Deciduous mountain woods.—Caucasus: W. Transc. (Abkhaz ASSR). Endemic. Described from specimens collected near Kvezani (Abkhaz ASSR). and cultivated in Tbilisi. Type in Tbilisi.

Note. According to Sosnovskii (l. c.), "a species closely related to *P. Sibthorpii*, from which it differs clearly in the denser pubescence throughout, especially on the calyx and pedicels, less deeply toothed calyx, lanceolate (not linear) calyx teeth, a longer corolla tube not enlarged at throat, purple (not rose) flowers, and broader corolla lobes".

The distribution area of this species has not been ascertained, and the species generally calls for further study under field conditions. Like *P. Komarovii* and *P. Woronowii*, *P. abchasica* is most probably a stable form of the hybrid cycle *P. vulgaris* × *P. Sibthorpii*.

16. *P. heterochroma* Stapf in Denkschr. Acad. Wien math. naturw. Kl. 50 (1885) 70; Pax in Engl. Bot. Jahrb. X, 181; Id. in Engl. Pflanzenr. IV, 237, 56; Grossg. Fl. Kavk. III, 207; A. Los. in Izv. AN SSSR, VII, 2, 305.—*P. acaulis* Jacq. Ldb. Fl. Ross. III (1847-1849) 10, ex. p.—*P. acaulis* Hohen. Enum. Talüsch. 87, non Jacq.—*P. acaulis* var. *Sibthorpii* (Rchb.) Pax from Kuzn. in Mat. Fl. Kavk. IV (1901) 78, ex p.—*P. vulgaris* subsp. *heterochroma* (Stapf) W.W. Sm. et Forrest in Not. Roy. Bot. Gard. Edinb. XVI (1928) 42; W.W. Sm. and Fletch. in Trans. Bot. Soc. Edinb. XXXIV, 4 (1948) 461.—*P. vulgaris* var. *heterochroma* Stapf in Bot. Mag. CLIII (1929) tab. 9166.—
P. heterochroma var. *flava* et var. *violacea* Grossh. in Beih. Bot. Centralbl. XLIII, 2 (1927) 1, 7, 8, 19.—*P. acaulis* Hohen. in Bull. Soc. Nat. Mosc. VI (1833) 220; Buhse u. Boiss. Aufzähl. 44.—*P. acaulis* var. *genuina* et var. *Sibthorpii* Chelkovn in Vestn. Tifl. bot. sada, 142 3 (1906) 9, 14.—*P. acaulis* var. *rosea* Lomak. in Tr. Tifl. bot. sada, I (1895) 60, non Boiss.—*P. amoena* var. *acaulis* C.A.M. in Verzeichn. Pflanz. Cauc. (1831) 114; Hohenack. in Bull. Soc. Nat. Mosc. XI (1838) 317.—Ic.: Bot. Mag. CLIII (1929) tab. 9166.

Perennial; leaves 3-11 cm long, 4-4.5 cm broad, oblong to ovate-oblong, obtuse, passing into a petiole ca. 3-4 cm long, finely sinuate-denticulate, membranous, green above, whitish-tomentose beneath; scapes none; pedicels shorter than the leaves, hairy; calyx 8-12 mm long, parted to the middle or lower down into narrowly lanceolate acute teeth, covered with

short hairs; flowers yellow, white, rose, or lilac; corolla tube 1 1/2-2 times the length of calyx, the limb flat, the bilobed lobes obcordate; capsule about as long as the calyx. December-April.

Clearings and outskirts of mountain woods. — Caucasus: Tal. **Gen. distr.:** N. Iran (Gilan). Described from Iran (Kuh-e-Darang). Type in Vienna.

Note. Our plants differ little from *P. Sibthorpii* Hoffmannsegg and the lower surface of the leaves is by no means always more densely pubescent (the only reliable distinguishing character of *P. heterochroma*). Corolla color is also extremely variable, and so is corolla size and some other characters.

Series 2. **Amoenae** Fed. — Scapes relatively long; flowers in a remotely-flowered umbel, this never secund; diameter of corolla limb equaling or exceeding the length of the tube; flowers rose or violet; calyx little accrescent in fruit.

17. *P. amoena* M. B. Fl. taur.-cauc. I (1808) 138, excl. var. β .; Lehm. Monogr. Primul. 39; Rupr. in Bull. Acad. Sc. Petersb. IV, 223; Boiss. Fl. or. IV, 280, ex p.; Shmal'g. Fl. II, 196; Pax in Engl. Pflanzenr. IV, 237, 180, ex p.; Somm. et Lév. in Tr. Bot. Sada, XVI, 333; Kuzn. in Mat. Fl. Kavk. IV, 66; ex p.; Grossg. Fl. Kavk. III, 205; W.W. Sm. and Fletch. in Trans. Bot. Soc. Edinb. XXXIV, 4, 407, ex p. — *P. elatior* Jacq. in Ldb. Fl. Ross. III (1847-1849) 9, ex p. — *P. elatior* var. *amoena* Duby in DC. Prodr. VIII (1844) 36; Rgl. in Tr. Bot. Sada, III, 133. — *P. amoena* var. *Kasbek* Kusn. l.c. 70. — *P. elatior* var. *dubia* Rgl. in Gartenfl. XXV (1876) tab. 877, a. — *P. amoena* var. *genuina* Pax in Engl. Bot. Jahrb. X (1889) 180. — Ic.: Lehm. l.c. tab. 3; Curtis Bot. Mag. tab. 3252; Rgl. l.c. t. 877, a; Pax, l.c. tab. 877; a; W.W. Sm. in Bot. Mag. (1940) tab. 9593. — Exs.: Ex herb. H.B. U. J. (sine numero).

143 Perennial; rootstock short, with somewhat stringy brown roots; leaves short-petioled, elongate-obovate to oblong, long-cuneate at base, obtuse or sometimes emarginate at apex, 5-10 (15) cm long, 2.5-4 (7) cm broad, denticulate or irregularly dentate but not lobate-dentate, glabrous above, more or less grayish-tomentose beneath, the blade gradually tapering into and 3-4 times as long as the winged petiole; scapes slender or stoutish, 2-3 times the length of leaves, the umbellate inflorescence 2-7-flowered and more; involucre bracts linear-subulate to narrowly linear-lanceolate; pedicels 2-3 times as long as the involucre; calyx narrowly cylindric, 1-1.3 mm long, somewhat angled at the nerves, dissected to about the middle into linear-lanceolate teeth; corolla tube 1 1/2 times the length of the calyx; corolla limb broad, up to 2-2.5 cm across, rose-purple, the lobes broadly obcordate, shallowly emarginate; capsule barely exerted from the calyx. June-July (Plate V, Figures 1, 1a).

Alpine meadows, rocks, and taluses, often near melting snow. — Caucasus: Cisc. (occurring only in the Central Caucasus). — Described from the northern slopes of the Caucasus. Mt. Besh Tau, near Pyatigorsk, is considered as the classical site, but this report is dubious. As the type specimen was lost, the specimen collected by Adams in N. Caucasus and identified still by Ruprecht and Boissier as *P. amoena* M.B., has been proposed as lectotype.

Note. N.I. Kuznetsov suggested the name *Kasbek Kusn.* for the typical form collected on Mt. Kazbek. This name is, however, redundant, as it refers to the true "forma genuina" which fully agrees with the illustrations of Leman (l.c.) made from the original collections of this species on the classical site.

18. **P. Meyeri** Rupr. in Bull. Acad. Sc. Petersb. VI (1863) 224; Rgl. in Tr. Bot. Sada, III, 1930, ex.p.; Grossg. Fl. Kavk. III (1934) 205.—*P. amoena* var. *Meyeri* (Rupr.) Boiss. in Fl. or. IV, (1879) 26; Shmal'g. Fl. II, 196; Pax in Engl. Pflanzenr. IV, 54; Kuzn. in Mat. Fl. Kavk. IV, 72; Somm. et Lév. in Tr. Bot. Sada, XVI, 333; W.W. Sm. and Fletch. in Trans. Bot. Soc. Edinb. XXXIV, 4 (1948) 411.—*P. amoena* var. *minuta* Kusn. in Delect. I plant. exs. (1898) 24.—*P. amoena* var. *glabrescens* Schmalh. in sched.—*P. amoena* subsp. *Meyeri* W.W. Sm. et Forrest in Not. Roy. Bot. Gard. Edinb. XVI (1928) 42.—Exs.: Kusn. Pl. exs. Edit. H.B.J. (sine numero, sub. var. *minuta* Kusn); GRF, No. 777 (sub var. *Meyeri* Boiss.).

144 Perennial; rootstock short, giving rise to numerous white somewhat stringy roots; leaves distinctly petiolate; leaf blades broadly ovate to oblong, cordate or short-cuneate at base, obtuse at apex, dentate, sometimes slightly lobate-dentate, 3-4 (5) cm long, 2-3 (4) cm broad, quite glabrous on both sides, thin, rugose, tapering into the petiole; petiole 1 1/2 times as long as the blade, somewhat winged, the margins of the wings often dentate or slightly lobed; scapes slender, twice the length of the leaves, bearing 2-4-flowered umbels; involucre bracts linear, subacute, 3-4 times as broad as the slender pedicels; calyx narrowly cylindric, somewhat angled at the nerves, parted to the middle into acutish linear-lanceolate teeth; corolla tube equaling to slightly exceeding the calyx, 1-1.3 mm long; corolla limb large, 2.5 cm across, lilac, the broadly obovate lobes bilobulate; capsule essentially included in the calyx. June-July.

Rocky places in the alpine zone, taluses, sites close to melting snow, and mountain meadows.—Caucasus: Cisc., W. Transc. **Gen. distr.:** Artvin area of Turkey. Described from Centr. Caucasus (El'brus). Type in Leningrad.

Note. Differs from the related species *P. Kusnetzovii* Fed. in the almost completely glabrous leaves and the restricted distribution area which is practically confined to the Caucasus.

Economic importance. A very decorative plant.

19. **P. Kusnetzovii** Fed. in Addenda XVI, 723.—*P. amoena* M.B. in Boiss. Fl. or. IV (1879) 26, ex.p.; Somm. et Lév. Tr. Bot. Sada, XVI, 333, ex.p.—*P. elatior* Jacq. in Ldb. Fl. Ross. III (1847-1849) 9, ex.p.—*P. Mnischeikii* Bayern, in sched.—*P. amoena* var. *grandiflora* Kusn. in Delect. I, Pl. exs. (1898) 25; Mat. Fl. Kavk. IV, 1, 75; Pax in Engl. Pflanzenr. IV (1909) 54; W.W. Sm. and Fletch. in Trans. Bot. Soc. Edinb. XXXIV, 4 (1948) 410.—*P. amoena* var. *hypoleuca* (Rupr. et Trautv.) Kusn. l.c. 75; Pax, l.c. 54; W.W. Sm. and Fletch. l.c. 410.—*P. amoena* var. *intermedia* Kusn. l.c. 72; Pax, l.c. 54; W.W. Sm. and Fletch, l.c. 410.—*P. amoena* var. *sublobata* Kusn. ibid. 69; Pax, l.c. 54; W.W. Sm. and Fletch. l.c. 411.—Exs.: Somm. et Lév. Iter. cauc. No. 908 (sub var. *Meyeri* Boiss.).

Perennial; rootstock short, with numerous dark-brown roots; leaves submembranous, rosulate, distinctly petiolate, broadly ovate or oblong,

subcordate or subcuneate at base, obtuse at apex, irregularly sinuate-dentate, almost lobulate, rugose, glabrate above, grayish- or white-tomentose beneath, 3-4 (5) cm long, 2.5-3 (4) cm broad, abruptly passing into and somewhat shorter than the petiole; scapes numerous or solitary, slender, twice as long as the leaves, terminating in a few-rayed umbellate inflorescence; flowers large, ca. 1.5-2 cm across, purple; involucre bracts linear; pedicels somewhat hairy or almost glabrous, slender, 145 2-2.5 cm long; calyx tube narrowly cylindric, hairy or glabrate, somewhat angled at the nerves, parted nearly to the middle into linear-lanceolate acute teeth; corolla tube equaling the calyx, enlarged into a somewhat incurved limb, the broadly obcordate lobes bifid; capsule cylindric, as long as the calyx or slightly exserted. June-July.

Mountain meadows, taluses, and rocks of the alpine zone, often close to snow.—Caucasus: Cisc., W. Transc. **Gen. distr.:** Pontic Range in Asia Minor. Described from Ossetia (Mt. Kariukhokh). Type in Leningrad.

Note. We have included under *P. Kusnetzovii* the earlier described varieties of *P. amoena* M.B. (see synonyms) distinguished by lobulate dentate leaves with tomentose underside. The distribution area of this species coincides with that of *P. Meyeri* Rupr., but the latter species does not occur in Turkish Lazistan.

Economic importance. A very decorative plant.

Series 3. **Veres** Fed.—Scapes long; inflorescence umbellate, often second; corolla always yellow, the long tube greatly exceeding the diameter of the incurved limb; calyx tubular, often strongly accrescent, often broadly campanulate from the start.

20. **P. veris** L. pl. I (1753) 142; Huds. Fl. Angl. (1762) 70; W.W. Sm. and Fletch. in Trans. Bot. Soc. Edinb. XXXIV, 4, 435.—*P. officinalis* (L.) Hill, Veg. Syst. VIII (1765) 25; Jacq. Misc. Austr. I, 159; Lehm. Monogr. Primul. 27; Koch, Synops. Fl. Germ. ed. 1, 586; Ldb. Fl. Ross. III, 8; Duby in DC. Prodr. VIII, 36; Boiss. Fl. or. IV, 24; Sagorski u. Schneid. Fl. Central-Karp. II, 381; Widmer, Europ. Art. Prim. 128; Shmal'g. Fl. II, 195, p.p.; Fedch. i Fler. Fl. Evrop. Rossii, 732; Syreishch. Ill. Fl. Mosk. gub. III, 28.—*P. veris* var. *officinalis* L. Sp. pl. (1753) 142.—*P. officinalis* var. *genuina* Pax in Engl. Bot. Jahrb. X (1889) 181; Korzhinsk. in Mem. Acad. Sc. Petersb. VII (1895) 283.—*P. officinalis* var. *genuina* f. *typica* Pax in Engl. Pflanzenr. IV, 237 (1905) 57.—Ic.: Rchb. Ic. Fl. Germ. XVIII, tab. 1090, 1106; Schlechtend. Langent. u. Schenk. Fl. v. Deutschl. ed. 5, tab. 1968; Syreishch. l.c. 28.—Exs.: GRF, XXI, No. 1029; Pl. Finland. exs. Nos 2040, 2041; 854a; 854b; Rgl. C. Fl. lithuan. exs. No. 70; Leo Derganc, Herb. Primul. (sine numero); Bordzilovsk, Fl. Ross. exs. (sine numero); Rehmann et Woloszczak, Fl. pol. exs. No. 244b; Herb. Dr. R. Pabo, V, 1; Herb. Fl. Ingr. No. 416; Annenkov, Fl. Mosq. exs. No. 43; Tarachkov, Gerb. Orlovsk. gub. (sine numero); Eesti Taimed. No. 10.

Perennial; rootstock oblique, with numerous whitish stringy roots; leaves including petiole 5-20 cm long, 2-6 cm broad, accrescent after 146 flowering, ovate to ovate-oblong or [?] obtuse at apex, abruptly passing into the petiole, crenate or irregularly erose-crenate, rugose, pubescent or glabrate and concave-veined above, pubescent or glabrous or slightly tomentose and convex-veined beneath; petioles shorter than blade,

narrowly winged; scapes 10-30 cm long, usually slightly hairy; inflorescence commonly one-sided; involucre bracts 2-7 mm long, linear-lanceolate, acute, pubescent; pedicels 3-20 mm long, hairy; calyx 8-15 mm long, tubular-campanulate, angled, slightly pubescent, parted to 1/3 into triangular acute teeth, usually not inflated before anthesis; corolla bright yellow, spotted orange at the base of lobes, about equaling the calyx, the rather narrow limb incurved (not flat) up to 0.8-1.5 cm across, the obcordate lobes emarginate; style in long-styled flowers equaling the corolla tube, in short-styled flowers half as long; capsule ovoid, as long as the calyx; seeds 1-1.5 mm long, short-ovaloid to subglobose, or irregularly cubic-angular, the surface blackish or brownish. Fl. May-June.

Dry glades, margins of deciduous woods and, in the North, birch woods.—European part: Balt., Lad.-Ilm., U. Dns., U. Dnp., M. D., Bl., Crim., U. V., V.-Don, L. Don. **Gen. distr.:** Centr. and S. Eur. Described from Europe. A specimen preserved in London is legitimized as lectotype of *P. veris*.

Note. Not readily distinguishable from *P. macrocalyx* Bge. which occurs in Siberia, Urals, Caucasus, and part of the Crimea. The following are the most distinctive characters: the leaf blade of *P. veris* is relatively short, elliptic, abruptly passing into the petiole, while *P. macrocalyx* is characterized by a longer blade tapering more gradually into the petiole; the calyx of *P. veris* becomes inflated only after flowering, whereas in the case of *P. macrocalyx* it is campanulately enlarged before flowering. In the south of Europe, *P. veris* is replaced by other species — *P. pannonica* Kerner (*P. canescens*), *P. Columnae* Tenore, *P. Velenovskyi* Fritsch, and some other species not occurring in the USSR. Exsicates of *P. veris* published in Finland and identified as varieties of some of these species are in fact merely pubescent forms of quite typical *P. veris*.

The correct translation of the epithet "veris" is "spring, vernal" (from ver, spring) and not "true" as sometimes erroneously suggested.

Economic importance. Many forms and hybrids are grown in gardens. Readily crossing with *P. elatior* and *P. vulgaris*. Spontaneous hybrids between *P. veris* and *P. vulgaris* have been found by V. A. Transhel in Siberia.

21. *P. macrocalyx* Bge. in Ldb. Fl. alt. I (1829) 209; Rupr. in Bull. Acad. Sc. Petersb. VI, 225; Boiss. Fl. or. IV, 25; Kerner, Sched. ad Fl. Austro-Hung. IV, 48 (ad specim. e semin. altaic. reprod.); Journ. Roy. Hort. Soc. XXXIX (1913) 168, 171; Grossg. Fl. Kavk. III, 205; Kryl. Fl. Zap. Sib. IX, 2129. — *P. veris* M. B. Fl. taur.-cauc. I (1808) 137. — *P. veris* subsp. *macrocalyx* (Bge.) Lüdi in Hegi, III. Fl. Mittel-Eur. V (1927) 1753; W. W. Sm. and Fletch. in Trans. Bot. Soc. Edinb. XXXIV, 4 (1948) 446. — *P. officinalis* var. *macrocalyx* (Bge.) C. Koch in Linnaea, XVII (1843) 307; Pax in Engl. Bot. Jahrb. X, 182; Korzhinsk. in Mem. Acad. Sci. Petersb. VIII ser. VII (1898) 253; Kuzn. in Mat. Fl. Kavk. IV (1901) 81; Pax in Engl. Pflanzenr. IV, 237, 58; Turkev. in Fl. Az. Ross. I, 15; E. Buschin Fl. Sib. i Dal'n. Vost. IV, 23; Kryl. Fl. Alt. III, 808. — *P. officinalis* var. *inflata* Ldb. Fl. Ross. III (1847-1849) 8; Rgl. in Tr. Bot. Sada, III, 132. — *P. uralensis* Fisch. ex Rchb. Icon. Bot. VII (1829) 18. — *P. officinalis* var. *infundibulum* C. Koch in Linnaea, XXIII (1850) 617. — *P. suaveolens* var. *colchica* Albow,

Prodr. Fl. Colch. (1895) 167. — *P. suaveolens* Radde, Grundzüge (1899) 260, 357. — *P. officinalis* var. *macrocalyx* f. *alpina* Kuntze in Tr. Bot. Sada, X, (1887) 210. — Ic.: E. Busch., l.c. 24; Fish. ex Rchb. l.c. tab. 638. — *P. volgensis* Bobr. in Sov. Bot. 2 (1944) 19, nomen. — Exs.: Fl. exs. Austro-Hung. No. 1372 (specim. e semin. altaic. reprod. GRF, No. 1121; Fl. cauc. exs. No. 165.

Perennial; rootstock oblique, with numerous stringy brownish or whitish roots; plants covered throughout with short sometimes faint pubescence; leaves ovate-oblong, but not short-elliptic, obtuse, rugose, obscurely crenulate-denticulate, 4-14 cm long, 2-7.5 cm broad, rather gradually rarely abruptly passing into the petiole, this winged, often dentate, cuneately enlarged upward, shorter than or equaling the blade; scapes 12-35 cm long; inflorescence 3-15-flowered, mostly secund; involucre bracts lance-linear, 4-10 mm long, with a green midrib, otherwise brownish, equaling or exceeding the lowest (shortest) pedicel, but much shorter than the remaining pedicels; pedicels 4-21 mm long, twisted sideways in flower, becoming straight and elongating in fruit to 14-26 mm; calyx always broadly campanulate-inflated in flower, 10-18 mm long, parted to 1/3 or less into triangular acute teeth; corolla yellow, orange-spotted within at the base of lobes, the tube equaling the calyx, the rather small incurved limb not more than 1 cm across, the suborbiculate lobes slightly emarginate; capsule ovaloid, about half as long as the calyx. May-June (Plate V, Figures 3, 3a).

Forest margins, coppices, and dry meadows; extending in mountain to upper limit of woody vegetation, but totally absent in alpine zone. — European part: V.-Kama, V., Crim.; W. Siberia; U. Tob.; Irt., Ob. (S.); E. Siberia; Ang.-Say. (W.); Caucasus: all regions. **Gen. distr.:** N. Iran. (Gilan*, Mazenderan**).

Note. For hybrid forms from the Volga region, E. G. Bobrov (l.c.) proposed the name *P. volgensis*.

Economic importance. Beside the use of the plant for ornament, fresh and dried leaves are recommended (G. D. Yaroshenko) as a source of vitamin C.

Series 4. Elatiores Red. — Scapes long; flowers in an umbellate inflorescence; pedicels erect; corolla yellow, the length of the tube about equaling the limb diameter; limb flat; calyx tubular, narrow in flower, little inflated in fruit.

22. *P. Ruprechtii* Kusn. in Delect. II pl. exs. (1899) 51; in Mat. Fl. Kavk. IV, 64; Grossg. Fl. Kavk. III, 206. — *P. elatior* subsp. *Ruprechtii* (Kusn.) Harrison in Trans. North Nat. Union, I (1931) 49, 74, 76; W. W. Sm. and Fletch. in Trans. Bot. Soc. Edinb. XXXIV, 4, 426. — *P. leucophylla* var. *Ruprechtii* (Kusn.) Pax in Engl. Pflanzenr. IV, 237 (1905) 53. — *P. leucophylla* subsp. *Ruprechtii* (Kusn.) W. W. Sm. et Forrest in Not. Roy. Bot. Gard. Edinb. XVI (1928) 42 et in Journ. Roy. Hort. Soc. LIV (1929) 21. — *P. amoena* var. *flava* Rupr. in Bull. Acad. Sc. Petersb. VI (1863) 223. — *P. elatior* var. *amoena* Rgl. in Tr. Bot. Sada, III (1874) 133, ex p. — *P. elatior* var. *genuina* Pax in Engl. Bot. Jahrb. X (1899) 186, ex p. — Ic.: Pax, l.c. (1905) f. 23a. — Exs.: Pl. or. exs. No. 165.

* [Also known as First Province.]

** [Former province, now partly in First Province, partly in Second.]

Perennial; rootstock short, with numerous rather thick brownish roots; leaves oblong-elliptic or obovate, obtuse, obscurely crenate-dentate, often revolute, gradually tapering into a broad winged petiole, slightly rugose, green and glabrous above, grayish-tomentulose with prominent brownish veins beneath; scapes mostly about twice as long as the leaves; scape and pedicels covered with short crisp hairs; involucre bracts 2-3, small, lanceolate, acute; flowers 3-5 (10), bright yellow; calyx subcylindric, the tube as a rule at least twice as long as the straight lanceolate acute teeth; corolla tube rather short, barely exerted from calyx; corolla limb broad, up to 2.5 cm across, the obovate lobes deeply emarginate between rounded segments; capsule ovoid, barely exerted from calyx. July.

In alpine ground cover, near melting snow.—Caucasus: Cisc., Dag., E. and W. Transc. Endemic. Described from Centr. Caucasus (Khabakh area near El'brus). Type in Leningrad.

Note. Usually associated with *P. amoena* M.B., but actually more
 149 akin to *P. Pallasii* Lehm. from which it differs only in the tomentose lower side of leaves and the distribution area which is located on the Greater Caucasus Range.

Economic importance. A decorative plant.

23. *P. Pallasii* Lehm. Monogr. Primul. (1817) 38; Boiss. Fl. or. IV, 26, excl. var. β ; Bge. in Ldb. Fl. alt. I, 208; Rupr. in Bull. Acad. Sc. Petersb. VI, 224; Harrison in Trans. North Nat. Union, I, 49 et al.; Grossg. Fl. Kavk. III, 206; Kryl. Fl. Zap. Sib. IX, 2130.—*P. elatior* subsp. *Pallasii* (Lehm.) W.W. Sm. et Forrest in Not. Roy. Bot. Gard. Edinb. XVI (1923) 42 et in Journr. Roy. Hort. Soc. LIV (1929) 21; W.W. Sm. and Fletch. in Trans. Bot. Soc. Edinb. XXXIV, 4 (1918) 424.—*P. elatior* var. *Pallasii* (Lehm.) Pax in Engl. Bot. Jahrb. X (1889) 179; Korzhinsk. in Mem. Acad. Sc. Petersb. VIII ser. VII, 284; Somm. et Lév. in Tr. Bot. Sada, XVI, 332, ex p.; Kuzn. in Mat. Fl. Kavk. IV, 58; Pax in Engl. Pflanzenr. IV, 237; 51; Turkev. in Fl. Az. Ross. I, 14; E. Busch in Fl. Sib. i Dal'n. Vost. IV, 20; Kryl. Fl. Alt. III, 809.—*P. elatior* (L.) Jacq. in Ldb. Fl. Ross. III (1847) 9, ex p.—*P. elatior* var. *genuina* Trautv. in Tr. Bot. Sada, V (1877) 455.—*P. altaica* Pall. apud Bge. in Ldb. Fl. alt. I (1829) 20.—*P. saguramica* Gavr. in Fl. Gruzii VII (1951) 27, nom. et descr. georg.—Ic.: Lehm. l.c. tab. 3; Lood. Bot. cab. (1829) tab. 1585; Bot. Reg. (1825) tab. 896; E. Busch, l.c. 22.—Exs.: Pl. or. exs. No. 192; Bornm. Anat. No. 3434.

Perennial; rootstock short, with numerous thickish stringlike adventitious roots; plants slightly pubescent or glabrous; leaves elliptic to oblong-obovate, irregularly and sharply dentate or erose-dentate (in Siberian plants) or almost crenate-dentate (Caucasian plants), 5-18 cm long, 2-7 cm broad, gradually tapering into and about twice as long as the winged petiole; leaf blade glabrous and smooth above, sparingly covered on the nerves beneath with short hairs, sometimes completely glabrous and even destitute of sparse tomentum; scapes 10-30 cm long, more or less pubescent or almost glabrous; umbel 2-15-flowered; involucre bracts lance-linear, 3-6 mm long, slightly pubescent, much shorter than the pedicels; pedicels finely puberulent, up to 2 cm long in flower, elongating in fruit; calyx cylindric, puberulent, 9-12 mm long, with 5 green angles, parted to 1/4-1/3 into ovate-lanceolate acute slightly recurved teeth; corolla pale yellow, the flat limb up to 2 cm across, the lobes obovate emarginate, the cylindric tube

about twice the length of the calyx; capsule oblong-ovoid. June (Plate V, Figure 4).

Alpine meadows, near melting snow, often also near the timberline.—
European part: V.-Kama (Permian Urals); Caucasus: W. Transc. (Batumi),
150 S. and E. Transc.; W. Siberia: Alt.; E. Siberia: Ang.-Say.; Soviet Central
Asia: Dzu.-Tarb. **Gen. distr.:** Asia Minor. Described from Altai. Type
in Berlin (?).

Economic importance: A decorative plant.

24. **P. poloninensis** (Domin) Fed. in Addenda, XVI, 724.—*P. elatori*
var. *carpathica* f. *poloninensis* Domin in Věda Pr. XI (1930) 241 et
in Domin et Krajina, Fl. Čechoslov. exs. No. 285.—Exs.: Fl. Čechoslov.
exs. No. 285.

Perennial; leaves oblong-elliptic to subovate-elliptic, distinctly crenate-
dentate, hirsute mainly on the veins beneath with long hairs, fairly rigid,
densely reticulate-veined, the lateral veins spreading at a nearly right
angle, gradually or sometimes abruptly but not cordately tapering into a
broadly winged and coarsely dentate petiole, this shorter than the blade;
scapes erect, more than twice as long as the leaves, densely covered with
somewhat spreading long white hairs; calyx short, slightly inflated in
flower, becoming inflated-campanulate; flowers large, up to 2 cm across,
yellow, the tube 1/3 as long again as the calyx; corolla lobes shallowly
emarginate; involucre bracts brownish, lanceolate, enlarged at base, 1/3
the length of pedicels, up to 1 cm long; inflorescence umbellate, 7-10-
flowered. June.

High-mountain zone, in *Festuca carpathica* association.—
European part: U. Dns. (Carpathians: Petros, Goverla and Bliznetsy Mts.).
Gen. distr.: not ascertained. Described from Svidovets. Type in Leningrad.

Note. K. Domin (l.c.) described this plant as *P. carpathica*. As
a matter of fact, our new species resembles *P. Pallasii* (the high-
mountain race of Caucaso-Altai) and the West European alpine
P. intricata Gr. et G. The last two species as well as *P. poloni-*
ensis occur in the high-mountain zone but not in the forest zone.

25. **P. elatior** (L.) Hill, Veg. Syst. VIII (1765) 50; Jacq. Misc. Austr.
I, 158; Lehm. Monogr. Primul. (1817) 33; Koch, Synops. Fl. Germ. ed.
1, 587; Duby in DC. Prodr. VIII, 36, excl. var. β .; Ldb. Fl. Ross. III,
9, p.p.; W.W. Sm. and Fletch. in Trans. Bot. Soc. Edinb. XXXIV, 4, 411;
Shmal'g. Fl. II, 195, p.p.—*P. veris* var. *elatior* L. Sp. pl. (1753)
143.—*P. elatior* var. *genuina* Pax in Engl. Bot. Jahrb. X (1889) 178.—
P. elatior var. *genuina* f. *typica* Pax in Engl. Pflanzenr. IV, 237
(1905) 49.—Ic.: Rchb. Ic. Fl. Germ. XVII (1855) tab. 1090; Schlechtend.
Langent. u. Schenk. Fl. v. Deutschl. ed. 5, XIV, tab. 1967; Ludi i Hegi,
III. Fl. Mittel-Eur. V, 208; W.W. Sm. a. Forrest in Journ. Roy. Hort.
Soc. LIV, f. B.—Exs.: Fl. exs. Austro-Hung. No. 1368; Fl. exs.
Reipubl. Bohem.-Sloven. No. 871; Petrak, Fl. Bohem. et Morav. exs.
151 Lfg. I, No. 75; Degen, Pl. Hungar. exs. (sine numero); Hayek, Fl. Stir.
exs. 6, No. 285; Domin et Krajina, Fl. Čechoslov. exs. Nos. 283, 284.

Perennial; rootstock oblique, with numerous stringy brownish roots;
leaves together with petiole 5-20 cm long, 2-7 cm broad, ovate to elliptic
or oblong, round-tipped, usually abruptly narrowed into a winged petiole,
crenate or denticulate or somewhat erose-dentate, rugose, puberulent

or glabrate above, somewhat hairy beneath, the veins concave above and convex beneath; petiole mostly about as long as the blade, the wings membranous, dentate or auriculate-dentate; scapes 10-39 cm long, erect, somewhat hairy especially below the apex; inflorescence umbellate, not secund, 5-10 (15)-flowered; involucre bracts 3-5 mm long, linear, tapering toward apex, somewhat hairy; pedicels 5-20 mm long, faintly hairy; calyx 10-15 mm long, tubular, 5-angled, parted to about the middle into 5 lanceolate acute teeth; corolla pale yellow, with a darker spot inside at base of lobes; limb broad, up to 2 cm across, flat, the lobes obovate; style in long-styled flowers equaling the corolla tube, in short-styled flowers half as long; capsule equaling the calyx, short-cylindric; seeds 1.5 mm in diameter, dark brown or black, their surface minutely tuberculate. May.

Meadows in foothills and in highly country, slopes, and margins of deciduous woods.—European part: U. Dns., M. D. **Gen. distr.:** S. and Centr. Eur. Described from Europe. Type in London.

Note. In the USSR confined to the West, near the Polish border. Regardless of existing reports, the species apparently does not occur in the Crimea or in the Baltic States.

26. **P. carpathica** (Griseb. et Schenk) Fuss, Fl. Transsylv. (1831) 534; Popov, Rast. i Fl. Karp. 222;—*P. elatior* subsp. *carpathica* (Fuss) W. W. Sm. et Forrest in Not. Roy. Bot. Gard. Edinb. XVI, 42; W. W. Sm. and Fletch. in Trans. Bot. Soc. Edinb. XXXIV, 4, 419.—*P. elatior* var. *carpathica* Griseb. et Schenk in Wiegmann's Arch. (1852) 320; Schneid. u. Sagorski, Fl. Central-Karp., II, 382; Pax in Engl. Pflanzenr. IV, 237 (1905) 50; Ludi in Hegi, Ill. Fl. Mittel-Eur. V (1927) 1748.—*P. subarctica* Schur in Oesterr. Bot. Zeitschr. XI (1861) 359.—*P. montana* Schur, Enum. Pl. Transsylv. (1866) 553.—*P. Columnae* Schur, l.c. 556, non Tenore.—*P. oblongifolia* Schur, l.c. 555.—Ic.: Roemer, Pflanzenwelt Burzenländ. Sieben-Bürg. (1898) tab. 14; Ungar, Alpenpfl. Südkarpath. (1913) tab. 17, f. 2.—Exs.: Aladár Richter, Fl. Hungar. Orient. exs. (sine numero).

152 Perennial; rootstock oblique, with whitish stringy roots; leaves rugose, undulate and crenate or obscurely crenate, finely glaucous-puberulent beneath, glabrate above, rounded-ovate, short-cuneate or subcordate at base, obtuse at apex, abruptly passing into a long and broad-winged petiole, which is 1 1/2-2 times as long as the blade; scapes about twice the length of leaves, up to 30-40 cm long, erect, beset with soft somewhat spreading white hairs; inflorescence umbellate, 7-10-flowered; involucre bracts lanceolate, acute, brownish, up to 0.6 cm long; pedicels 0.5-1 cm long, soft-pubescent; calyx narrowly cylindric in flower, becoming somewhat inflated, parted to 1/3 into lanceolate acute teeth, angled at nerves; corolla tube 1 1/2 times the length of calyx, up to 1.5 cm long, the broad pale sulfurous limb 1.5 cm across, the broadly obovate lobes shallowly emarginate; capsule subglobose, included in and about half as long as the calyx. June.

Mountain meadows.—European part: U. Dns. (E. Carpathians, reported by M. G. Popov, l.c.). **Gen. distr.:** W. Carpathians, Transylvanian Alps. Described from Transylvania. Type in Budapest (?).

Note. The species represents a local Carpathian race of *P. elatior* affiliation. Distinguished chiefly by the more pronounced pubescence and stronger growth.



Plate VI

1. *Primula longiscapa* Ldb., 1a) calyx with capsule. 2. *P. darialica* Rupr., 2a) calyx with capsule. 3. *P. sachalinensis* Nakai, 3a) calyx with capsule. 4. *P. farinosa* L. 5. *P. baldshuanica* B. Fedtsch. 6. *P. algida* Ad., 6a) calyx with capsule.

27. **P. cordifolia** Rupr. in Bull. Acad. Sc. Petersb. VI (1863) 225; Grossg. Fl. Kavk. III, 206; Somm. et Lév. in Tr. Bot. Sada, XVI, 332 (incl. var. *ovalifolia* Somm. et Lév.).—*P. elatior* subsp. *cordifolia* (Rupr.) W.W. Sm. a. Forrest in Not. Roy. Brit. Gard. Edinb. XVI (1928) 42 et in Journ. Roy. Hort. Soc. LIV (1929) 21; W.W. Sm. and Fletch. in Trans. Bot. Soc. Edinb. XXXIV, 4 (1948) 420.—*P. elatior* var. *cordifolia* (Rupr.) Pax in Engl. Bot. Jahrb. X (1889) 179; id. in Engl. Pflanzenr. IV, 237 (1905) 51; Kuzn. in Mat. Fl. Kavk. IV, 1, 62; id. in Tr. Bot. Sada Yur'evsk. Univ. I, 68.—*P. Meyeri* var. *cordifolia* Rgl. in Tr. Bot. Sada, III, 1 (1874) 130.—*P. Pallasii* var. *cordifolia* Boiss. Fl. or. IV (1879) 26.—Exs.: Pl. or. exs. No. 192; A. et V. Borth. Fl. cauc. No. 735.

155 Perennial; rootstock short, clothed in thick brownish roots; a rather large plant, up to 30-40 cm tall in fruit; leaves oblong-ovate, subcordate at base, obtuse, irregularly sinuate-dentate, thinly chartaceous, with a convex broad midrib on both sides, glabrate or minutely and sparsely pubescent beneath, both surfaces dull green, the petiole broad winged; scapes about twice the length of leaves, rather stout, glabrous or very slightly covered with short hairs; inflorescence umbellate; involucre leaves few, linear, partially deciduous; pedicels unequal, fairly short, somewhat exceeding to sometimes twice the length of the involucre; calyx cylindric, parted to the middle into acute lanceolate erect teeth, almost glabrous; corolla lemon-yellow, the broad tube twice the length of calyx, the broad limb up to 2.5 cm across; corolla lobes obovate, shallowly emarginate; the short lobules obtuse; capsule ovoid, brownish, dehiscing with short valves. May.

Subalpine meadows and birch woods near the timberline.—Caucasus: Cisc., Dag., E. Transc. Apparently absent in Colchis. Endemic. Described from Central Caucasus (Kazbek, Kobi). Type in Leningrad.

Economic importance. A decorative plant.

28. **P. pseudoelatior** Kusn. in Tr. Bot. Sada Yur'evsk. Univ. I (1900) 68; Mat. Fl. Kavk. IV, 63; Pax in Engl. Pflanzenr. IV, 237, 49; Journ. Roy. Hort. Soc. XXXIX, 168, 171; Grossg. Fl. Kavk. III, 206.—*P. elatior* subsp. *pseudoelatior* (Kusn.) W.W. Sm. et Forrest in Not. Roy. Bot. Gard. Edinb. XVI (1928) 42 et in Journ. Roy. Hort. Soc. LIV (1929) 21; W.W. Sm. and Fletch. in Trans. Bot. Soc. Edinb. XXXIV, 4, 425.—*P. Pallasii* subsp. *pseudoelatior* (Kusn.) Harrison in Trans. North Nat. Union, I (1931) 49 et al.

Perennial; rootstock short, with a tuft of thickish whitish roots; leaves oblong-ovate, obtuse, cordate or subtruncate at base, passing from the sinus into and as long as or somewhat longer than the broad winged petiole, obscurely crenate-dentate, glabrate above, rather densely hirtellous beneath; scapes slightly exceeding the leaves; involucre leaves linear acuminate; pedicels glandular-puberulent; calyx cupuliform, parted to the middle into broad triangular-lanceolate acute recurved teeth, densely glandular-hirtellous, strongly accrescent in fruit and enclosing the capsule; corolla yellow, drying bluish, the limb flat, the tube slightly exceeding the calyx; corolla lobes obovate, deeply notched between two obtuse lobules; capsule ovoid. June.

Alpine and subalpine meadows.—Caucasus: Cisc., W. Transc. (Adzharia). **Gen. distr.** Asia Minor (Pontic Range). Described from W. Caucasus. Type in Leningrad.

Note. Most closely resembling *P. cordifolia*, from which it differs in the densely pubescent calyx with broad recurved teeth and the densely pubescent underside of leaves.

Economic importance. A decorative plant.

Section 5. **ALEURITIA** Duby in DC. Bot. Gall. I (1828) 384; Id. in DC. Prodr. VIII (1844) 41; emend. Schott. Sippen d. österr. Prim. (1851) 10.—*Farinosae* Pax in Engl. Bot. Jahrb. X (1889) 194, pro sect.—Calyx tubular, terete; seeds small, rounded-angular; corolla with a flat or nearly flat limb and often annularly folded at throat; involucre bracts auriculate or gibbous at base or not so; leaves slightly rugose or plane. Plants rather prominently farinose, sometimes inconspicuously so, or only some leaves farinose. Section type: *P. farinosa* L.

Series 1. **Frondosae** Fed.—Leaves naked or white-farinose beneath, obovate or spatulate, distinctly serrate-dentate or sharply serrate; pedicels slender, filiform, often flexuous; calyx short, rounded-turbinate.

29. **P. ossetica** Kusn. in Mat. Fl. Kavk. IV, 1 (1901) 112; Grossg. Fl. Kavk. III, 208; W.W. Sm. and Fletch. in Trans. Roy. Soc. Edinb. LXI, 1 (1944) 30; Pax in Engl. Pflanzenr. (1905) 82; Balf. f. in Journ. Roy. Hort. Soc. XXXIX (1913) 169, 172; W.W. Sm. et Forrest, Journ. Roy. Hort. Soc. LIV (1929) 33 et Not. Roy. Bot. Gard. Edinb. XVI (1928) 25.

Perennial; rootstock short, with a tuft of slender white roots; small plants, up to 10 cm tall; leaves thin, obovate to obovate-spatulate, round-tipped, long-cuneate at base, subsessile (without a distinct petiole), finely crenate-dentate, slightly yellowish-farinose, ca. 4 cm long and 1.5-2 cm broad; scape about twice the length of leaves, rather slender; umbel many-rayed; pedicels up to 15, slender, greatly exceeding the involucre; involucre bracts lanceolate, acute, somewhat saccate at base, up to 2 mm long; calyx small, turbinate, up to 5 mm long, the lanceolate acute teeth
157 about as long as the tube; corolla violet, the tube about equaling the calyx, the broad limb up to 1.5 cm across; corolla lobes bilobulate, as long as or longer than the tube; capsule unknown. June.

Rocky meadows.—Caucasus: Cisc. (Ossetia). Endemic. Described from Mt. Kariukhokh in Ossetia. Type in Leningrad.

Note. Described from a single specimen collected by the author of the species, N.I. Kuznetsov. The yellowish farinaceous bloom mentioned by the author is visible only with the aid of a magnifying glass. The species needs further study.

30. **P. darialica** Rupr. in Bull. Acad. Sc. Petersb. VI (1863) 236; Rgl. in Tr. Bot. Sada, III, 145; Boiss. Fl. or. IV, 30; Pax in Engl. Bot. Jahrb. X (1889) 191; Pax in Engl. Pflanzenr. IV, 237, 78; Balf. f. in Journ. Roy. Hort. Soc. XXXIX, 168, 192; Lipsk. Fl. Kavk. 386; Somm. et Lév. in Tr. Bot. Sada, XVI, 336.—*P. darialica* Rupr. var. *typica* Kusn. in Mat. Fl. Kavk. IV (1901-1908) 109; Grossg. Fl. Kavk. III, 208; W.W. Sm. and Fletch. in Trans. Roy. Soc. Edinb. LXI, 1, 13 (excl. subsp. *farinifolia*);

W.W. Sm. et Forrest. in Not. Roy. Bot. Gard. Edinb. XVI, 23 et in Journ. Hort. Soc. LIV (1929) 32. — *P. zeylamica* Char. et. Kap. in Fl. Gruzii VII (1951) 27 nom. et descr. georg. — Ic.: Balf. f. l.c.f. 22; Watson in Gard. Chron. LXIII, 233. — Exs.: A.H. et V.F. Brotherus Pl. Cauc. Nos. 739, 740.

Perennial; rootstock short, with a tuft of rather slender white roots; plants up to 10-15 cm tall, glabrous; leaves thin, devoid of bloom or very faintly farinose on the lower side, obovate-lanceolate or subspatulate, gradually tapering into a winged petiole, finely and sharply serrate, the teeth acute or sometimes almost subulately acuminate, the veins scarcely convex; scapes at least twice as long as the leaves; umbels 2-15-flowered; pedicels slender subfiliform, unequal, as long as to nearly twice the length of the flowers, slightly curved; involucre bracts linear, sometimes many, shorter than the pedicels; calyx subspherical, the narrowly linear acute teeth as long as the tube; corolla carmine or rose, drying bluish, the flat limb up to 1 cm across, the tube 1 1/2-2 times the length of the calyx; corolla lobes obovate, bilobulate; capsule narrowly pointed, about twice as long as the calyx. June (Plate VI, Figures 2, 2a).

Damp shaded rocks of the forest and subalpine altitude zones. — Caucasus: Cisc. (Centr. Caucasus). Endemic. Described from Daryal' Gorge. Type in Leningrad.

Economic importance. A decorative plant.

31. ***P. farinifolia*** Rupr. in Bull. Acad. Sc. Petersb. VI (1863) 236; Boiss. Fl. or. IV, 29; Rgl. in Tr. Bot. Sada, III, 145; Pax in Engl. Bot. Jahrb. X (1889) 191; Id. in Engl. Pflanzenr. IV, 234 (1905) 79; Lipsk. 158 Fl. Kavk. 386; Grossg. Opred. rast. Kavk. 597. — *P. darialica* var. *farinifolia* (Rupr.) Kusn. in Mat. Fl. Kavk. IV, 1 (1901-1908) 110; Grossg. Fl. Kavk. III, 208. — *P. darialica* subsp. *farinifolia* (Rupr.) W.W. Sm. and Fletch. in Trans. Roy. Soc. Edinb. LXI, 1 (1944) 14.

Perennial; rootstock short, with a tuft of rather slender light-brown roots; low plants, up to 15-20 cm but mostly ca. 10 cm tall; leaves thin, obovate to oblong-spatulate, obtuse, rather coarsely dentate (the sharp teeth divergent, sometimes almost subulate), gradually tapering into and about as long as the petiole, dull green above, rather densely white- or somewhat yellowish-farinose; scapes exceeding the leaves, glabrous; umbel many-flowered; pedicels up to 30, long, slender, glabrous, flexuous; involucre bracts many, linear, much shorter than the pedicels; flowers pale rose, rather small; calyx subspherical, white-farinose, green-nerved; calyx teeth linear, acute, recurved or erect, as long as or somewhat longer than the tube; corolla tube 1 1/2-2 times as long as the calyx, the limb flat, the lobes deeply bilobulate; capsule cylindric, 1 1/2-2 times as long as the calyx. July-August.

Crevices of damp rocks in the subalpine zone. — Caucasus: Dag., Cisc. (Khevsuriya). Endemic. Described from Dagestan. Type in Leningrad.

Note. Differs from *P. darialica* in being densely farinose, in having many-rayed inflorescences and smaller flowers, and in its distinct distribution area.

Series 2. **Algidae** Fed. — Leaves bare or farinose; involucre bracts reflexed, especially in fruit; corolla tube equaling the calyx; A vicarious species — *P. capitellata* Boiss. (Iran).

32. *P. algida* Ad. in Weber. u Mohr, Beitr. Naturk. I (1805) 46; Lehm. Monogr. Primul. 68; Duby in DC. Prodr. VIII, 39; Rupr. in Bull. Acad. Sc. Petersb. VI, 233; Boiss. Fl. or. IV, 29; Pax in Engl. Bot. Jahrb. X (1899) 190; Somm. et Lev. in Tr. Bot. Sada, XVI, 335; Pax in Engl. Pflanzenr. IV, 237 (1905) 73; W.W. Sm. and Fletch. in Trans. Roy. Soc. Edinb. LXI, 1, 6; Turkev. in Fl. Az. Ross. I, 24.—*P. algida* var. *sibirica* (Ldb.) Pax, l.c. (1905) 73; E. Buschin Fl. Sib. i Dal'n. Vost. IV, 58.—*P. algida* var. *armena* (Koch) Pax in Engl. l.c. (1905) 73; Turkev. l.c. 26.—*P. algida* var. *denudata* Kryl. Fl. Alt. III (1904) 811, non Rupr.—*P. algida* f. *typica*, f. *cuspidens*, f. *colorata* Rgl. in Tr. Bot. Sada, III (1874) 147.—*P. farinosa* M.B. Fl. taur.-cauc. I (1808) 139, p.p.; Ldb. Fl. Ross. III, 13, p.p.—*P. farinosa* var. *armena* C. Koch in Linnaea, XVII (1843) 308; Pax, l.c. (1889) 199; Kuzn. in Mat. Fl. Kavk. IV, 96.—*P. farinosa* var. *algida* et var. *armena* Trautv. in Tr. Bot. Sada, IX (1876) 391.—*P. farinosa* var. *armena* f. *albo-farinosa* et f. *nazarensis* Derganc in Tr. Bot. Sada, XXI (1903) 371.—*P. farinosa* var. *caucasica* C. Koch. l.c. XVII (1843) 308.—*P. farinosa* et var. *pauciflora* C. Koch, l.c. XXIII (1850) 616.—*P. farinosa* var. *luteo-farinosa* *lusus caucasica* et *lusus turkestanica* Rgl. in Tr. Bot. Sada, III (1874) 141, 142.—*P. auriculata* Bge. apud Ldb. Fl. alt. I (1829) 211, non Lam. (cum f. *albiflora* et f. *excapa*).—*P. auriculata* Bge. et f. *caucasica* f. *sibirica*, f. *excapa* in Bge. I Suppl. Fl. alt. (1836) 15, non Lam.—*P. auriculata* var. *sibirica* Ldb. Fl. Ross. III (1847-1849) 12.—*P. longifolia* M.B. l.c. 422.—*P. Bungeana* C. A. M. in Beitr. Pflanzenk. Russ. Reich, VI (1849) 22; Kryl. Fl. Zap. Sib. IX, 2131.—*P. caucasica* C. Koch, l.c. XXIII (1850) 614.—*P. luteo-farinosa* var. *denudata* Rupr. l.c. 235.—*P. Hookeri* Freyn et Sint. in Bull. Herb. Boiss. IV (1896) 142.—Ic.: Lehmann, l.c. tab. 7; E. Busch, l.c. 58; Rgl. in Gartenfl. XXIV (1875) tab. 824, f. a-c; id. l.c. XII (1863) tab. 416, f. 1.—Exs.: GRF, XX, No. 979.

Perennial farinose or bare, the short rootstock giving rise to numerous whitish roots; leaves including petiole 1.5-7 cm long, mostly 3-4 cm long, 0.5-2.5 cm broad but often 1-1.5 cm, oblong to subobovate, round-tipped or obtuse, gradually tapering into the petiole; petioles sometimes half as long as the blade but mostly much shorter; finely and sometimes sharply serrate, very rarely entire, bare above, sometimes glabrous but often whitish- or yellowish-farinose beneath with veins distinctly showing from under the waxy bloom; scapes 3-20 cm long, elongating up to 35-40 cm in fruit, bare or farinose below the apex; umbels compact, subcapitate, mostly 3-12-flowered; involucre bracts 3-11 mm long, 1-2 mm broad, linear to linear-lanceolate, acute, somewhat auriculate at base and always distinctly reflexed especially in fruit; calyx 5-10 mm long, long-campanulate, 5-nerved, bare or farinose, parted to about the middle into oblong or lanceolate acute or obtuse teeth, commonly violet-tinged; corolla with a fat or rarely whitish limb and a yellowish or white tube; tube slightly shorter than or equaling the calyx, enlarged at throat; style in long-styled flowers $\frac{2}{3}$ the length of corolla tube, in short-styled flowers $\frac{1}{3}$; capsule oblong, equaling the calyx; seeds 0.5 mm long, irregularly subglobose or ovoid, brown. June-July (Plate VI, Figures 6, 6a).

Alpine meadows and sods, often near snow.—Caucasus: Cisc., W. and 160 S. Transc., Dag.; W. Siberia: Alt., Soviet Central Asia: Pam.-Al., T.

Sh., Dzu.-Tarb. **Gen. distr.:** N. Mong., N. Iran. Described from the Caucasus. Type apparently lost.

Note. Although it occupies an extensive area, *P. algida* Ad. does not differentiate into distinctive races. The forms of the Pamir and of the Caucasus are quite alike; neither do Altaian plants display any substantial differences. Yellowish- and whitish-farinose forms occur side by side with the completely glabrous variety. In the Altai, the bare variety grows almost exclusively, but it does not display any other differences and cannot be called a distinct species.

Series 3. Pseudoalgidae Fed.—Leaves glabrous or farinose beneath, commonly sharply serrate or almost glabrous, obovate-lanceolate or subspatulate; umbels compact; pedicels short, often shorter than involucre, the bracts not reflexed. So far only the species described below is known in this section.

33. ***P. baldshuanica* B.** Fedtsh, in O. and B. Fedch. *Perech. rast.* TurkX (1913) 6; Turkev. in Fl. Az. Ross. I, 1, 27; Balf. f. in Journ. Roy. Hort. Soc. XXXIX, 168, 173; W. W. Sm. et Forrest, Journ. Roy. Hort. Soc. LIV, 32 et in Not. Roy. Bot. Gard. Edinb. XVI, 23; W. W. Sm. and Fletch. Trans. Roy. Soc. Edinb. LXI, 1, 8.

Perennial; rootstock short, with a tuft of rather slender brownish roots; plants smooth, but often rather densely white-farinose especially on the lower leaf surface, more rarely without bloom (f. *efarinosa* B. Fedtsch.); leaves oblong-obovate, obtusely round-tipped, gradually cuneately tapering into a fairly long slender petiole, rarely subsessile, irregularly erose-denticulate (the teeth subappressed or divergent), 4-7-8 (14) cm long, 10-15-20 (27) mm broad; scapes rather slender, 7-15-20 to sometimes 35 cm long, farinose in upper part and finally bare; umbel many-flowered, compactly capitate; involucre bracts narrowly linear, acute, enlarged and minutely gibbous at base, 8-14 mm long; pedicels in flower shorter than involucre, becoming much elongated; calyx gently angled, campanulate, 5-8 mm long, parted to 1/3 or to the middle into linear green or dark-colored acutish slightly recurved teeth; corolla violet, the flat limb up to 15 mm across but commonly not more than 9 mm; corolla lobes obovate or obcordate, rather deeply notched and thus bilobulate; corolla tube 9-12 mm long, about twice the length of calyx; capsule equaling the calyx, oblong. March-May (Plate VI, Figure 5).

161 Mountain slopes and river valleys. — Soviet Central Asia: Pam.-Al. (Tadzhikistan). Endemic. Described from Muminabad. Type in Leningrad.

Series 4. Fariniferae Fed.—Leaves whitish- or yellow-farinose beneath, rarely bare; corolla with whitish tube and violet or rose limb; inflorescence a many-rayed umbel; pedicels straight.

34. ***P. farinosa* L.** Sp. pl. I (1753) 143; Lehm. Monogr. Primul. 52; Duby in DC. Prodr. VIII, 44; Rgl. in Tr. Bot. Sada, III, 140; Pax in Engl. Bot. Jahrb. X (1889) 198, p. p.; id. in Engl. Pflanzenr. IV, 237 (1905) 82, p. p.; Turkev. in Fl. Az. Ross. I, 18, ex p.; E. Busch in Fl. Sib. i Dal'n. Vost. IV, 39; W. W. Sm. and Fletch. in Trans. Roy. Soc. Edinb. LXI, 1, 16, ex p.; Kom. Fl. Kamch. III, 22; Ldb. Fl. Ross. III, 12, ex p.; Shmal'g. Fl. II, 196, ex p.; Kryl. Fl. Zap. Sib. IX, 2132; Turcz. Fl. baic.-dah. II, 2, 228. — *P. farinosa* var. *genuina* Koch in Linnaea, XVII (1843) 307. — *P. farinosa* var. *typica* Rgl. l.c. 140. — *P. farinosa* var. *leucophylla* Trautv. et Mey. Fl. ochot. (1856) 66. —

P. farinosa subsp. *enfarinosa* var. *genuina* Pax, l.c. (1905) 83.—*P. xanthophylla* Trautv. et Mey. l.c. 42; E. Busch, l.c.—*P. Auricula* Hill. Veg. Syst. VIII (1765) 25.—*P. nivalis* Turcz. ex Steud. Nomencl. ed. 2, II (1841) 395.—*Aleuritia farinosa* Spach, Hist. Veg. Phanerog. IX (1840) 360.—*Androsace farinosa* Spreng. Pugill. II (1815) 37.—Ic.: Fl. Dan. I (1769) tab. 125; Hill, Herb. Brit. II tab. 128; Curtis Fl. Londin, II, f. 4, tab. 14; Rchb. Ic. Fl. Germ. XVII, tab. 1092, f. 1 et 2; E. Busch, l.c. 41; Hegi, Ill. Fl. V, tab. 209.—Exs.: GRF, No. 517; Pl. Finland. exs. No. 853; Fl. exs. Reip. Bohem.-Sloven. No. 450; Fl. lituan. exs. No. 71; Fl. Českoslov. exs. No. 278; Dörf. Herb. norm. No. 4589; Herb. Primul. Leo Desganc (sine numero); Hayek, Fl. Stir. exs. No. 1021; Wettst. Fl. exs. Austro-Hung., No. 907; Eesti Taimed, No. 10.

Perennial, whitish or yellowish-farinose plants; rootstock short, giving rise to numerous whitish roots; leaves including petiole 1-10 cm long, 0.3-2 cm broad, mostly 1.5 cm long and 0.5-1 cm broad, oblanceolate or oblong-obovate to elliptic or ovate, rounded or obtuse at apex, gradually tapering into the petiole, entire or finely and sometimes obscurely denticulate, glabrous or nearly so above, rather densely white- or yellowish-farinose beneath, the veins always showing rather distinctly through the farinaceous bloom; scapes 2-15 (30) cm long, farinose near apex; umbels commonly many-flowered; involucre bracts 2-5 (8) mm long, narrowly lanceolate, sometimes mucronate, commonly acute or acuminate, often slightly enlarged at base and then gently gibbous though sometimes 162 inconspicuously so, more or less farinose; pedicels straight, usually markedly longer than involucre, often farinose; calyx 3-6 mm long, cylindric or urceolate, farinose especially inside, slightly angled, parted to 1/3 or to the middle into oblong or triangular-oblong obtuse or subacute sometimes dark-tinged teeth; corolla lilac or bright to dark purple, rarely pale to pure white, with whitish or greenish tube; corolla tube 5-8 mm long, about equaling or exceeding the calyx; limb up to 8-10 mm across, flat, with obcordate bilobulate lobes; style in long-styled flowers about reaching the throat, in short-styled flowers half as long as the calyx; capsule cylindric, 5-6 (9) mm long, scarcely or markedly exceeding the calyx; seeds 0.5 mm long, ovoid to rounded-angular, the surface minutely pustulose. May-June (Plate VI, Figure 4).

Meadows in mountains and on plains.—Arctic: Arc. Eur.; European part: Kar.-Lap., Lad.-Ilm., Dv.-Pech., Balt.; W. Siberia: Ob (S.), Alt.; E. Siberia: Ang.-Say., Dau., Yen.; Far East: Okh., Kamch. **Gen. distr.:** mountains of Europe, especially Scandinavia, N. Mong. Described from Europe. Type in London (?).

Note. *P. farinosa* L. s.l. displays much variability over its extended distribution area and is partly differentiated into distinct races. These include: *P. longiscapa* Ldb. (W. Siberia), *P. sachalinensis* Nakai (Far East, Sakh.), *P. gigantea* Jacq. (mainly Yakut ASSR and Transbaikalia), *P. Hornemanniana* Lehm. (Pyrenees, Alps), *P. mistassinica* Michx. (N. America), *P. stricta* Hornem. (European section of the Arctic), *P. exigua* Velen. (Balkans), *P. megellanica* Lehm. (S. America). *P. farinosa* L. s. str. also falls readily into a large number of clearly distinguishable forms in samples collected at random, but they are found to be connected by numerous transitional forms when ample material is examined. There are no qualitative morphological differences between these forms (described as var. var. *xanthophylla*,

leucophylla, albiflora, flexicaulis, littoralis, pygmaea, etc.). Among the independent species of *P. farinosa* L. affiliation indicated above, the least satisfactory appear to be *P. sachalinensis* Nakai which displays overlapping characters, while the most distinctive is *P. longiscapa* Ldb. It should be noted that the Kamchatkan *P. farinosa* does not differ at all from the Central European one.

Economic importance. Grown in gardens as early as 1558 (Camerarius). A renowned ornamental plant.

35. ***P. sachalinensis*** Nakai in Bot. Mag. Tokyo, XLVI (1932) 61; Popov in Bot. zhurn. SSSR, XXXIX (1949) 492. — *P. farinosa* var. *xanthophylla* W.W. Sm. and Fletch. (non Trautv. et Mey.) in Trans. Roy. Soc. Edinb. LXI, 1 (1944) 18, p.p. — *P. farinosa* var. *chrysophylla* Trautv. et Mey. Fl. ochot. (1856) 66; E. Buschin Fl. Sib. i Dal'n. Vost. IV (1925) 31; Turkev. in Fl. Az. Ross. I, 21; Sugawara, Ill. Fl. of Saghal. IV, 1517. — Ic.: Sugawara, l.c.f. 1517. — Exs.: Herb. Saghal. Centr. Exper. Stat. No. 1114.

Perennial, up to 35-40 cm in flower; leaves distinctly petiolate, together with petiole 5-7 cm long, cuneately spatulate or oblong, cuneate at base, obtuse at apex, irregularly dentate or serrate, sometimes erose-dentate, densely sulfureous-farinose beneath, tapering into a slightly winged petiole, which is about twice as long as the blade, the veins on the underside often almost concealed by the farinaceous bloom; scapes rather stout, sometimes subfistular, bare or below inflorescence yellow-farinose; inflorescence a many-flowered umbel containing up to 20 flowers; involucre lance-linear, enlarged and somewhat saccate at base, slightly farinose, 5-7 mm long; pedicels bare, 3-4 (5) times the length of the involucre, unequal; calyx greenish, often farinose, parted to more than 1/3 into lanceolate subobtusate teeth. ca. 5-6 mm long; corolla violet, the tube twice the length of the calyx, the flat limb up to 1 cm across, the limb more intensely colored than the often almost white tube; corolla lobes obcordate, deeply bilobulate; capsule cylindric, dishiscing at apex into spreading valves, 2 1/2 to sometimes nearly 3 times as long as the calyx. Fl. June-August; fr. August (Plate VI, Figure 3, 3a).

Wooded rocks. In Sakhalin it was also collected on the Mangutan mud-volcano. — Far East: Uda (Shantarskie Is.), Uss., Okh., Sakh. Described from Sakhalin. Type in Tokyo.

Note. A scarcely stabilized race related to *P. farinosa*. The Sakhalin primrose can be distinguished by the stronger growth, the distinctly petiolate and somewhat rhomboidal densely yellow-farinose leaves, and the relatively long capsule. Additional characteristics include the elongating flowering pedicels and the sacculate base of involucre bracts.

The contemporary monographers of the genus *Primula*, Smith and Fletcher (l.c.) consider *P. farinosa* var. *xanthophylla* Trautv. et Mey. synonymous with *P. sakhalinensis*. There is, however, another variety which is synonymous with this species, namely var. *chrysophylla* Trautv. et Mey. This variety was described by Trautvetter and Meyer from Medvezhii Island (from the Shantarskie island group), and, both as regards distribution area and characters, it corresponds exactly to *P. sakhalinensis* later described by Nakaya. On the other hand, var. *xanthophylla* was described from the surroundings of Irkutsk where the Sakhalin primrose does not reach. The latter variety should be referred to the polymorphic species *P. farinosa* L.

It is of interest that Trautvetter and Meyer (l. c.) were inclined to regard their var. *chrysophylla* as a distinct species ("Varietatem chrysophyllam facile specimen propriam dicas").

36. *P. gigantea* Jacq. in Misc. Austr. I (1778) 160; Lehm. Monogra. Primul. 61; Trautv. in Tr. Bot. Sada, IX (1884).5.—*P. davurica* Spreng. in Gartenzeit. II (1804) 113; Lehm. l. c. 58.—*P. exaltata* Lehm. l. c. 57.—*P. undulata* Fisch. ex Rchb. Iconogr. Bot. V (1824) 41.—*P. lepida* Duby in DC. Prodr. VIII (1844) 44.—*P. intermedia* Sims in Bot. Mag. XIII (1809) tab. 1219.—*P. altaica* Turcz. in Fl. baic.-dah. II, 2 (1856) 226, p.p. non Lehm.—*P. farinosa* var. *denudata* Koch, Syn. fl. Germ. (1837) 586; Ldb. Fl. Ros. III (1847-1849) 13; Turkev. in Fl. Az. Ross., I, 1, 20; E. Busch in Fl. Sib. i Dal'n. Vost. IV, 39; W.W. Sm. and Fletch. in Trans. Roy. Soc. Edinb. LXI, 1, 17.—*P. farinosa* var. *gymnophylla* Trautv. et Mey. Fl. ochot. (1856) 66.—*P. farinosa* var. *glabrata* Maak, Wil. Reiseroute (1871) 61.—*P. farinosa* var. *undulata* (Fisch.) Rgl. in Tr. Bot. Sada, III (1874) 147.—*P. farinosa* var. *lepida* (Duby) Pax in Engl. Bot. Jahrb. X (1889) 199.—*P. farinosa* subsp. *davurica* var. *intermedia* Pax in Engl. Pflanzenr. IV, 237 (1905) 86, p.p.—Ic.: Lehm. l. c. tab. VI (fig. manca); F; Fisch. ex Rchb. l. c. tab. 468, f. 660; E. Busch, l. c. 43; Spreng. l. c. 113; Sims. l. c. tab. 1213 (fig. manca).

Perennial, efarinose, with a short perennating root; leaves obovate or spatulate or almost rhomboid, tapering into and slightly shorter than or equaling the petiole, the blade 0.5-1 (1.5) cm broad, together with petiole 2-5 (7) cm long, dentate or sharply (sometimes almost spinulously) dentate, crenate or entire; scapes rather slender, 1.5 mm to rarely 2 mm thick, 10-15 (35) cm long; inflorescence an umbel containing 2-5 or more often 10 or more flowers; involucre bracts linear-lanceolate, 2-3 (4) mm long, adhering to pedicels; pedicels 1-3 cm long, sometimes markedly unequal, elongating in fruit up to 5 cm and more; calyx campanulate, 5-nerved, 3-4 mm long, parted to 1/3 into obtuse or acute teeth; corolla rose-violet with a yellowish throat and a flat limb, the tube only slightly exceeding the 167 calyx; corolla lobes obcordate, deeply notched; capsule cylindric, slightly exserted from the calyx. June-July.

Humid meadows of the taiga zone.—E. Siberia: Ang.-Say., Dau., Lena-Kol. **Gen. distr.:** N. Mong. (?) Described from Yakut ASSR (Aldan). Type probably in Vienna.

Note. Represents an efarinose race of the complex *P. farinosa* L. s. l., with characteristic often sharply dentate leaves, covering a well-defined area in E. Siberia. Having recognized this plant as a distinct species, we are obliged to retain the rather absurd designation "*gigantea*" applied to it by Jacquin. This author happened to have tall specimens (about an ell in height — cubitus) and thus adopted the unsuitable name. The plant, however, is not usually more than 15 cm tall, with small leaf rosettes and small inconspicuous flowers. Jacquin gives a very poor description (9 words), and were it not for the reference to Fleming (Fl. sib.) which indicates the site where the plants were collected, it would be quite impossible to determine to which plant the name actually applies. Moreover, because of insufficient material, our species was again described as new on several occasions: by Spengler as *P. davurica*, by Leman as *P. exaltata*, and by Fischer as *P. undulata*. Fischer's type is preserved in the Leningrad herbarium. Sims described a certain



Plate VII

1. *Primula sibirica* Jacq. 2. *P. fistulosa* Turkev. 3. *P. Knorringiana* Fed. 4. *P. pamirica* Fed. 5. *P. Iljinskii* Fed., 5a) calyx with capsule. 6. *P. Matsumurae* Pekitm. 7. *P. borealis* Duby. 8. *P. Halleri* J.F. Gmel.

P. intermedia which may also be included among synonyms of *P. gigantea* and certainly not of *P. longiscapa* Ldb. as proposed by Ledebour himself and by later authors, right up to the contemporary monographers of the genus *Primula*, W. Wright Smith and Fletcher. The resolution of the complicated problem of synonyms of *P. gigantea* Jacq. has now become possible owing to the ample material available in Leningrad.

37. *P. pinnata* M. Pop. et Fed. in Addenda XVII, 725.

Perennial, minute, 3-8 cm tall, glabrous; rootstock short and obsolescent, with long fibrous roots; leaf rosettes dense, small, 1-3 cm in diameter; leaves glabrous, 0.8-2 cm long; leaf petiole equaling or slightly longer than the blade, gradually dilated toward base, bluish, glabrous; blades narrowly oblong or lanceolate, pectinate and irregularly lacinate-pinnatifid to about the middle, the small sublinear lobes sometimes falcately recurved, the leaf apex triangular, entire, acute; scapes 3-8 cm long, erect, firm, glabrous; umbel 2-10-flowered, one-third to one-half as long as the scapes, fasciculate in fruit; involucre bracts linear-subulate
168 from ovate-triangular submembranous base, about half the length of the pedicels; pedicels firm, glabrous, 4-8 mm long, erect; calyx glabrous, campanulate; 3-4 mm long, subpentagonous, scarcely modified in fruit, the teeth about as long as the tube, lance-linear from ovate-triangular base, acute; corolla (purplish-blue?), the tube 4-5 mm long, the lobes obtriangular, bilobular to 1/3-1/2, the lobules bidentate with a short interior tooth and an exterior tooth 3-4 times as long; capsule oblong-cylindric, half as long again as the calyx, 4-5 mm long, brownish, dehiscing with 5 obtuse thickish valves; seeds ovaloid, brown, 0.25-0.75 mm in diameter, smooth. Fr. August.

Humid meadows with *Cobresia* association.—E. Siberia: Ang.-Say. Endemic. Described from the shores of Lake Baikal (near village of Sarma). Type in Leningrad, cotype in Irkutsk.

Note. Closely resembling *P. gigantea* Jacq., but differing in its subpinnatifid leaves, few-flowered inflorescence and low growth. Apparently constitutes a distinct Baikal race of the series *Fariniferae* Fed.

38. *P. longiscapa* Ldb. in Mem. Acad. Sc. Petersb. V (1815) 520; Bge. in Ldb. Fl. alt. I, 212; Ldb. Fl. Ross. III, 12; Rgl. in Tr. Bot. Sada, III, 147, p.p.; Turkev. in Fl. Az. Ross. I, 1, 21; Kryl. Fl. Zap. Sib. IX, 2133.—*P. altaica* Lehm. Monogr. Primul. (1817) 59.—*P. intermedia* E. Buschin Fl. Sib. i Dal'n. Vost. IV (1925) 50, non Sims.—*P. intermedia* Bobr. in Fl. Yugo-vost. VI (1936), 26 non Sims.—*P. intermedia* W.W. Sm. and Fletch. in Trans. Roy. Soc. Edinb. LXI, 1 (1944) 23, non Sims.—Ic.: E. Busch, l.c. 51 (sub. *P. intermedia*); Ldb. Ic. Fl. Ross. IV, tab. 348; Rgl. Gartenfl. (1883) tab. 1132, f. 2; Lehm. l.c. tab. V (fig. manca).—Exs.: Kar. and Kir. exs. No. 407.

Perennial, efarinose, with a short perennating root; leaves oblong to oblong-elliptic, gradually narrowed into a fairly long or short slightly winged petiole, rarely sessile, entire or irregularly and obscurely dentate, 2-10 cm long, 0.5-2 cm broad; scapes rather firm and often fairly stout, up to 2.5 mm thick in fruit, greatly exceeding the leaves, 10-30 cm long, elongating in fruit up to 40-45 cm; umbel many-flowered, dense; involucre bracts linear-lanceolate, initially flat becoming reflexed,

faintly gibbous at base; pedicels unequal, often at first equaling the involucre, rather strongly elongating and in fruit 4-5 times as long; flowers rather small, purple or rose-violet; calyx tubular-campanulate, parted to about the middle into lanceolate acuminate lobes; corolla limb flat, 8-15 mm across, the obcordate lobes notched down to about the middle, the tube slightly longer than the calyx; capsule oblong-ovaloid, about twice the length of the calyx. June (Plate VI, Figures 1, 1a).

Steppe belt, insolonchaks, saline and, humid meadows, and shores of rivers and lakes. — European part: Transv., V.-Kama (S.); W. Siberia; Alt.; E. Siberia: Ang.-Say. (only W. Sayans, Tuva Autonomous Region); Soviet Central Asia: Balkh., Dzu.-Tarb. **Gen. distr.** NW Mong. Described from Baraba Steppe. Type in Leningrad.

Note. Very often, though quite erroneously, *P. longiscapa* Ldb. is identified with the much earlier described *P. intermedia* Sims. The very inadequate description of Sims and his unsuccessful illustration do not permit identification of these species, even though Ledebour also considered the species described by Sims as a synonym of his *P. longiscapa*. However, Léman, the first monographer of the genus *Primula*, quite rightly identified *P. intermedia* Sims. with *P. davurica* Spreng. and consequently — as it transpired later — with *P. gigantea* Jacq., *P. undulata* Fisch., and *P. exaltata* Lehm. On the other hand, Léman described Ledebour's plant as a distinct species — *P. altaica*. Apparently Léman was merely aware that Lodiger had sent to England seeds of this same species which Sims subsequently described from garden-grown specimens as *P. intermedia* and Sprengle under the name *P. davurica*. Sims' description thus refers to the Transbaikalian plant, i.e., *P. gigantea* Jacq., and not to the Altai primrose. The exceedingly poor drawing of Sims definitely recalls *P. gigantea* Jacq. much more than *P. longiscapa* Ldb., particularly since all pedicels are represented as equal, a situation which never occurs in *P. longiscapa* Ldb. but is rather often associated with *P. gigantea* Jacq. Sims considers as characteristic of his species the weakness of the scapes compared with those of *P. farinosa* and other species as well as the somewhat crenate leaves which are, in fact, typical for *P. gigantea* Jacq. while quite unknown in *P. longiscapa* Ldb. The latter species often has firm and stout scapes and, as a rule, practically entire leaves.

39. ***P. stricta*** Hornem. in Fl. Dan. (1810) tab. 1385; Duby in DC. Prodr. VIII, 44; Ldb. Fl. Ross. III, 13; Rgl. in Tr. Bot. Sada, III, 139; Pax u. Knuth in Engl. Pflanzenr. IV, 237, 86; W.W. Sm. and Fletch. in Trans. Roy. Soc. Edinb. LXI, 1, 35; Hult. Fl. of Alaska a. Yukon, VIII, 1274. — *P. farinosa* var. *stricta* (Hornem.) Wahlenb. Fl. Lapp. (1812) 60. — *P. Hornemanniana* Lehm. Monogr. Primul. (1817) 55, p.p. — *P. mistassinica* Gray, Syn. Fl. N. Amer. II (1878) 58, p.p. nec. Michx. — *P. farinosa* var. *mistassinica* Pax in Engl. Bot. Jahrb. X
170 (1889) 200, p.p. — *P. farinosa* var. *grenlandica* Pax in Pax u. Knuth in Engl. Pflanzenr. IV, 237 (1905) 84, p.p. — Ic.: Bih. Svensk Vet. Acad. Handl. XII, f. 7, e-i; Mathiasen in Meddel. Groenl. XXXVII, f. 10, e-i; Macoun a. Holm. Rep. Can. Arct. Exped. V, tab. XI, f. 6; Lehm. l.c. tab. 4. — Exs.: Pl. Finland. exs. No. 322a et 322b; Fellman, Pl. Arct. No. 197; F. Schultz, Herb. norm. Cent. 21, No. 2039; Reliquiae Maileanae, No. 322.

Perennial, completely efarinose or nearly so; roots rather slender, whitish; leaves together with petiole 0.5-4 cm long, the blade 2-15 mm broad, narrowly obovate to oblanceolate or elliptic, rounded-obtuse at apex, narrowed into and equaling or longer than the rather inconspicuous petiole, entire or sinuate-dentate, bare or faintly farinose beneath, the midrib rather distinct, the lateral veins indistinct; scapes varying greatly in length, 2-20 cm long, efarinose, the umbel 1-8-flowered; involucre bracts 3-8 mm long, lanceolate to acutely lanceolate, mostly gradually acuminate, not mucronate, dilated and saccate at base, often very minutely glandular-ciliate; pedicels in flower equaling or barely exceeding the involucre, erect, elongating in fruit up to 4 cm; calyx 4-6 mm long, 3.5-5 mm broad, urceolate-campanulate, often farinose at the angles and between the teeth, commonly parted to the middle into oblong or lanceolate obtuse or acute often glandular-ciliate lobes; corolla violet or lilac, the tube half as long again as the calyx, the limb 5-8 mm across, parted into narrow or oblong shallowly emarginate lobes; capsule ovoid, barely exceeding the calyx; seeds dark-colored, angular, the surface finely reticulate.

Humid meadows in the tundra. — Arctic: Arc. Eur. (islands of the western part of the Arctic Ocean, Kolguev, Vaigach; on the mainland from western Murmansk Region to the Bol'shezemel'skaya Tundra), Nov. Z.; European part: Kar.-Lap., Dv.-Pech. (Pechora R. basin). **Gen. distr.** Sweden, Norway, N. Am. Described from Scandinavia. Type in Copenhagen.

Note. The occasional reports on the occurrence of this species in the eastern sector of the Arctic are erroneous. The species to be found on the islands (Kolguev and Novaya Zemlya) is *P. stricta* and not *P. farinosa* as often claimed.

Series 5. Fistulosae Fed. — Leaves oblong-ob lanceolate, glabrous; scape long, often stout and fistular; involucre bracts subtriangular, short, fleshy, gathered in large numbers at the base of pedicel to form a club-shaped apex of the scape. Only the one species described below is so far known in this section.

- 171 40. *P. fistulosa* Turkev. in Bot. Mat. Gerb. Glavn. Bot. Sada, II (1921) 15; Fl. Az. Ross. I, 1, 23; E. Buschin Fl. Sib. i Dal'n. Vost. IV, 55; Kon. and Alis. Opred. rast. Dal'nevost. kr. II, 847; Kitagawa in Lineam. Fl. Mansh. (1935) 352; W.W. Sm. and Fletch. in Trans. Roy. Soc. Edinb. LXI, 1, 19. — *P. farinosa* subsp. *fistulosa* (Turkev.) W.W. Sm. et Forrest in Not. Roy. Bot. Gard. Edinb. XVI (1928) et in Journ. Roy. Hort. Soc. LIV (1929) 32. — *P. longiscapa* Kom. in Fl. Manch'zh. III (1905) 224, non Ldb. — Ic.: E. Busch, l.c. 56. — Exs: F. Karo, Pl. Amur. et Zeaënses (curav. J. Dörfler) No. 99 (sub *P. altaica* Lehmann).

Perennial, bare or very faintly farinose, from a short perennating root; leaves together with petiole 2.5-12 cm long, 3-15 mm broad, oblong to oblong-ob lanceolate, obtuse, subsessile or gradually tapering into a short and broadly winged petiole, irregularly dentate; scapes 5-20 cm long, elongating in fruit up to 30-47 cm, often fistular and stout, up to 6 mm thick, sometimes slightly farinose below the apex; inflorescence many-flowered, spherical-umbellate, containing 5-40 flowers; involucre bracts oblong-ovate, more or less acute, dilated at base, 2-4 mm long, imbricated and alternating with the pedicels; pedicels 4-20 mm long, mostly 8-15 mm, densely glandular-pubescent, at length partly reflexed; calyx 4-5 mm long,

campanulate or cupuliform, gradually narrowed into the pedicel, prominently nerved, parted to the middle into lanceolate acute dark-green teeth; corolla rose-violet, the tube about equaling 1 1/2 times the length of the calyx, the flat limb 8-14 mm across, the obovate lobes deeply notched; stamens commonly inserted about the middle of the corolla tube; capsule equaling or slightly exceeding the calyx. April-May (Plate VII, Figure 2).

Humid meadows and river valleys. — Far East: Ze.-Bu., Uss. **Gen. distr.:** Manchuria, NE Mong. Described from the vicinity of the town of Blagoveshchensk (on the Amur R.). Type in Leningrad.

Economic importance. A very ornamental plant.

Series 6. Boreales Fed. — Leaf blades small, subrhomboid or short-ovate or obovate, abruptly passing into the petiole, yellow-farınose or quite glabrous beneath. Flowers small, in few-flowered umbels. Plants not more than 10 cm tall.

41. **P. borealis** Duby in Mem. Soc. Phys. Hist. Nat. Genève, X (1843) 31; id. in DC. Prodr. VIII, 43; Ldb. Fl. Ross. III, 15; Kom. Fl. Kamch. III, 24; Turkev. in Fl. Az. Ross. I, 1, 16; E. Busch in Fl. Sib. i Dal'n. Vost. IV, 31; Pax u. Knuth in Engl. Pflanzenr. IV, 237, 81, p.p.; W.W. Sm. and Fletch. in Trans. Roy. Soc. Edinb. LXI, 1 (1944) 8; Hult. Fl. of Alaska a. Yukon, VIII (1948) 1268. — *P. parvifolia* Duby in DC. Prodr. VIII (1814) 42; Hulten, l.c. 1273. — *P. Hornemanniana* Hook. in Fl. Bor. Am. II (1838) 120, p.p. non Lehm. — *P. farinosa* var. *stricta* (Wahlenb.) Trautv. in Tr. Bot. Sada, VIII (1883) 12. — *P. farinosa* var. *mistassinica* Pax in Engl. Bot. Jahrb. X (1889) 200, p.p. — *P. Chamissonis* E. Busch in Fl. Sib. i Dal'n. Vost. IV (1925) 28. — *P. stricta* var. *jacutensis* E. Busch, l.c. 36. — *P. Kawasimae* Hara in Journ. Jap. Bot. XVII, No. 11 (1941) 633. — Ic.: Duby, l.c. tab. 2, f. 2; Macoun a. Holm, in Rep. Canad. Arct. Exped. V (1921) tab. XI, f. 4; E. Busch, l.c. 31 et 37 (sub *P. stricta* var. *jacutensis*).

Perennial, completely bare or very faintly farınose, from a short rootstock; leaves together with petiole 0.4-4 cm long, 1-10 mm broad, cuneately obovate or spatulate, rounded-obtuse at apex, tapering into and 1/3-1/2 as long as the petiole, dentate or finely denticulate or almost entire, efarınose above, beset beneath with glands, these sometimes faintly whitish-farınaceous, the midrib and lateral veins pronounced; scapes commonly 3-8 (12) cm long, in small specimens sometimes not exceeding 1 cm in length, naked or slightly farınose below apex, often purple-tinged; umbel 1-14-flowered; involucre 2-6 mm long, the bracts linear mucronate or acutely lanceolate, distinctly saccate and often dilated at base, commonly finely purple-striped and sometimes slightly farınose; pedicels 2-15 mm long, slightly exceeding the involucre and occasionally 2-3 times as long, elongating in fruit up to 2.5 cm, bare or very faintly farınose; calyx 3-6 mm long, campanulate, often somewhat gibbous at base, parted to the middle into lance-ovate or lanceolate obtuse or acute teeth; corolla rose-violet or lilac, the tube cylindric, enlarged at throat, mostly equaling but sometimes nearly twice as long as the calyx, the limb 7-20 mm across with broadly or narrowly obcordate lobe; heterostyly pronounced, the style exerted or equaling the corolla tube; capsule cylindric, half as long again as the calyx. July (Plate VII, Figure 7).

Marshy or stony places in the tundra. — Arctic: Arc. Sib., Chuk., An.; Far East: Kamch. (possibly). Also known from Sakhalin (see note).

Gen. distr.: Ber. (Alaska, islands of the Bering Sea). Described from Alaska (Shishmaref Inlet). Type in Geneva; a cotype in Leningrad.

- 173 **Note.** Comparison of *P. Chamissonis* E. Busch described in "Fl. Sib. i Dal'n. Vost." (1925) with topotypic *P. borealis* Duby, has proved beyond doubt that the former is simply a synonym of the latter. Similarly, *P. stricta* var. *jacutensis* E. Busch belongs here. The true *P. stricta* Hornem. does not occur in the eastern section of the Arctic region either in typical form or as a variety. Hultén (l.c.) envisages the possibility of setting up *P. parvifolia* Duby as a distinct species. He considers, however, *P. Chamissonis* E. Busch as synonymous with this primrose.

According to more recent data (W.W. Sm. a. Fletch. Trans. Bot. Soc. Edinb. XXXV, 2 (1950) 187, 188), *P. Kawasimae* Hara described from Sakhalin, should also be regraded as a synonym of *P. borealis*. Thus, the earlier report of Miabe and Tatevaki (Trans. Sapporo Nat. Hist. Soc. XIV (1935) 78) concerning the occurrence of *P. borealis* in Sakhalin retains its validity.

42. ***P. Matsumurae*** Petitm. in Bull. Herb. Boiss. VII (1907) 528; W.W. Sm. and Fletch. Trans. Roy. Soc. Edinb. LXI, 1, 24. — *P. modesta* subsp. *ajanensis* (E. Busch) W.W. Sm. et Forrest in Journ. Roy. Hort. Soc. LIV (1929) 32. — *P. Fauriae* Sugawara, Ill. Fl. Saghal. IV (1940) 1517, non Franch. — *P. ajanensis* E. Busch. in Fl. Sib. i Dal'n. Vost. IX (1925) 34; Kom. Fl. Kamch. III, 24. — *P. borealis* var. *ajanensis* (E. Busch) Hultén in Fl. of Alaska a. Yukon, VIII (1948) 1268. — Ic.: Petitm. l.c.f. 4; Tatevaki, Pl. Isl. Rebun. 14 (1934) tab. III, f. 7, 8; E. Busch, l.c. 34 (sub *P. ajanensis*); Sugawara, l.c. 517 (sub *P. Fauriae*).

- Perennial, yellowish-farinose, 8-15 cm tall, the short rootstock giving rise to rather slender brownish roots; leaves together with petiole 3-10 cm long, 1-2 cm broad, ovate or obovate or rhomboidally spatulate, round-tipped, gradually or rather abruptly passing into and mostly about half as long as the narrowly winged petiole, obscurely dentate or crenate, commonly densely yellowish-farinose beneath and very faintly so above; scapes 5-13 cm long, more or less farinose; inflorescence umbellate, containing up to 12 flowers; involucre bracts 3-10 mm long, acutely lanceolate to narrowly oblong, farinose, without any indication of a saccate base; pedicels 1-1.5 cm long, elongating in fruit up to 3 cm, farinose; calyx 5-8 mm long, campanulate or tubular-campanulate, commonly farinose, parted to the middle into lanceolate teeth; corolla purplish-rose, the tube equaling or exceeding the calyx, the limb 1.5-2 cm across, the
174 obcordate lobes deeply notched and sometimes somewhat toothed at apex, capsule cylindric, mostly twice the length of the calyx. June-August (Plate VII, Figure 6).

Humid meadows. — Far East: Okh., Kamch., Sakh., Kurile Is. **Gen. distr.:** Korea, Japan. Described from Japan (Rebun-jima Is., off Hokkaido Is.). Type in Geneva.

Note. The Japanese botanist Sugawara (l.c.) reports for Sakhalin the species *P. Fauriae* Franch., but the species growing here as well as in the Kurile Islands is in fact *P. Matsumurae* Petitm. The true *P. Fauriae* is confined to Japan (described from Mt. Shikhinoko).

Series 7. Sibiricae Fed.—Subsect. *Sibirica* W.W. Sm. and Fletch. in Trans. Roy. Soc. Edinb. LXI, 1 (1944) 44, ex p.—Leaves glabrous, abruptly passing into the petiole, the blade orbicular or rounded-oblong; inflorescence a loose few-flowered umbel; calyx and involucral bracts covered above or beneath with minute black glands.

43. *P. sibirica* Jacq. Misc. Austr. I (1778) 161; Lehm. Monogr. Primul. (1817) 60; Duby in DC. Prodr. VIII, 43; Turcz. Fl. baic.-dahur. II, 2, 226; Ldb. Fl. Ross, III, 14; Rgl. in Tr. Bot. Sada, III, 150 (var. *brevicalyx*); Bge. in Ldb. Fl. alt. I (1829) 213; Kryl. Fl. Alt. III, 812; Bobr. in Fl. Yugo-vost. VI, 25; Kryl. Fl. Zap. Sib. IX, 2134; E. Busch in Fl. Sib. i Dal'n. Vost. VI, 61; Turkev. in Fl. Az. Ross. 32, partim; W.W. Sm. a. Fletch. in Trans. Roy. Soc. Edinb. LXI, 1, 53, p.p.; Hult. Fl. of Alaska a. Yukon, VIII (1948) 1273.—*P. intermedia* Ldb. in Mem. Acad. Sc. Petersb. V (1815) 519, non Sims.—*P. rotundifolia* Pall. Reise, III (1776) 223, nomen.—*P. nutans* Georgi, Reise, I (1775) 200, nomen.—*P. sibirica* var. *brevicalyx* Trautv. Pl. imag. Fl. Ross. (1844) 44; E. Busch, l.c. 63.—*P. sibirica* natio *ochotensis* E. Busch, l.c. 64.—*P. sibirica* var. *rotundifolia* Pax. in Engl. Bot. Jahrb. X (1889) 197.—*l.c.*: Gmel. Fl. sib. IV (1769) tab. 46, f. 1; Lehm, l.c. tab. V (f. *dextra*); E. Busch, l.c. 62.—*Exs.*: Martianow, Plantae Minussinenses exs. No. 650.

Perennial, efarinose throughout; leaves rosulate, orbicular or rounded-ovate, sometimes subelliptic, entire or obscurely and distantly dentate, 0.7-1.5 cm long excluding the petiole, 0.8-1.5 (2) cm broad, abruptly passing into the petiole, this up to 4 cm long; scape rather slender, 10-20 cm long, often strongly elongating in fruit; inflorescence umbellate, nodding before anthesis, the pedicels later becoming erect; flowers 3-5 (8); involucral bracts oblong, subacute, auriculate (the auricle adhering to scape), sometimes sparsely dotted with minute black glands; calyx tubular-campanulate, parted to 1/3 into narrow teeth, at length often somewhat
175 divergent, sparsely dotted with minute black glands or not so; corolla rose, the limb broad, the tube twice the length of the calyx; corolla lobes obcordate, deeply notched; capsule cylindric, somewhat attenuate at apex, dehiscing with narrow valves, slightly exceeding the calyx. June-July (Plate VII, Figure 1).

Moist meadows, grassy mounds, and river valleys. In spite of existing reports, not occurring in mountains.—W. Siberia: Ob, Irt., Alt.; E. Siberia: Ang.-Say., Yen., Lena-Kol.; Far East: Ze.-Bu., Okh., Uda, Kamch. **Gen. distr.**: N. Mong., N. Am. Described from Siberia. Type in London.

Note. The only form occurring in Siberia is the so-called var. *brevicalyx* Trautv. which is the typical form. The varietal name is thus superfluous. Invariably hybridizing with *P. finmarchica* Jacq. to which the Siberian primrose is, in fact, very closely related. The characters of these species as reported in various "floras" and determination keys, are also very much intermixed. Most characteristic for the Norwegian primrose is the short corolla tube, as opposed to the tube of the Siberian primrose, which is twice the length of the calyx. It is, however, precisely this character which is frequently a subject of confusion (c.f., for instance: Perfil'ev, Fl. Sev. Kraya (1936) or Stankov — Taliev, Opred. vyssh. rasten. Evrop. chasti SSSR (1949)).

The source responsible for this confusion is probably Ledebour's *Flora rossica* (III, 14).

A mixture of forms occurs in the Dvina-Pechora area. Some of these can be referred to *P. sibirica*, and others to *P. finmarchica*. Thus, this is where the boundary line between the two related species apparently passes, or else this is the region where *P. finmarchica* varies most strongly and gives rise to forms which are transitional to *P. sibirica*. In other words these are either hybrid forms between the two primroses or deviating forms of *P. finmarchica*. But since farther east in the direction of Siberia the two species no longer occur together, all the European specimens belong most probably to *P. finmarchica*.

44. *P. finmarchica* Jacq. in Misc. Austr. I (1778) 160; Perfil'ev, Fl. Sev. Kraya, II-III (1936) 259; Il'insk. in Bot. Mat. Gerb. Fl. Bot. Sada, II, 8 (1921) 32. — *P. norvegica* Retz. Fl. Scand. Prodr. (1795) 35; Lehm. Monogr. Primul. (1817) 66. — *P. integrifolia* Oeder in Fl. Danica (1767) tab. 168. — *P. sibirica* var. *integrifolia* (Oeder) Pax in Engl. Pflanzenr. IV, 237 (1905) 77. — *P. sibirica* ssp. *finmarchica* (Jacq.) Hult. Fl. of Alaska a. Yukon, VIII (1948) 1274. — *P. sibirica* var. *finmarchica* (Jacq.) Pax in Engl. Bot. Jahrb. X (1889) 197. — Ic.: Oeder, l.c. tab. 188 (sub. nom. *P. integrifolia* Oeder). — Exs.: Schultz, Herbar. norm. nov. ser. Cent. 17, No. 1620 (sub *P. sibirica* Jacq.); Pl. Finland. exs. No. 1278 (sub *P. sibirica* Jacq.).

176 Perennial, glabrous, efarinose; leaves rosulate; leaf blade orbicular or rounded-elliptic, entire, abruptly attenuate into the petiole, together with petiole 2-5 cm long, commonly 0.7-1.5 cm broad; scapes rather slender, 10-15 (20) cm long, elongating in fruit; inflorescence few-flowered, 2-3 (4)-rayed; involucral leaves 2-3, sometimes 4 or more, oblong-lanceolate, acuminate, the auriculate appendage at base adhering to scape; pedicels filiform, commonly erect (not nodding), glabrous, elongating in fruit, 0.7-4 cm long; calyx tubular-campanulate, parted to 1/3 into oblong acutish at length somewhat reflexed teeth, smooth or sparsely dotted with black glands; corolla lilac or rose, the limb broad, the tube barely exceeding the calyx; corolla lobes obovate, deeply notched; capsule cylindric, exceeding the calyx; ferruginous-brown dehiscent at apex by narrow valves. May-June.

Moist meadows in the north of the taiga belt and the tundra. — Arctic: Arc. Eur. (Kanin Peninsula, Kolguev Is.); European part: Kar.-Lap., Dv.-Pech., Lad.-Ilm. **Gen. distr.:** Scand. Described from N. Europe. Location of type unknown.

Note. A species most closely resembling *P. sibirica* Jacq. and scarcely distinguishable from it in herbaria. The distinguishing characters of these species, as mentioned by Jacquin in his original descriptions show overlapping and are unreliable. The only character, first mentioned by the earliest monographer of the genus, Léman, and again later by the recent monographers W. Wright Smith and Fletcher, is the long corolla tube of *P. sibirica* Jacq. which amounts to twice the length of the calyx, as opposed to the short tube of *P. finmarchica* Jacq. that about equals the calyx. Smith and Fletcher, however, place both races in a single species. In order to settle finally the problem of independent status for the Finnish and Siberian primroses, it is necessary to conduct observations in cultivation as compared with plants growing in natural conditions.

45. *P. Iljinskii* Fed. in Addenda XVII, 726.— *P. sibirica* auct. Fl. turkest. p.p. non Jacq.— *P. sibirica* var. *parviflora* Rgl. (in sched. ad specim. zeravsch.).

Perennial, slender throughout; glabrous, efarinose; leaves exclusively rosulate, oblong-spatulate or obovate, gradually tapering into and 1/3-1/2 as long as the narrow petiole, entire or sometimes obscurely denticulate, 3-5 (7) cm long, 0.5-0.7 mm broad; scapes slender, sometimes almost filiform, 10-17 (35) cm long, strongly elongating after anthesis, 0.5-1.5 mm thick; umbel few-flowered, the unequal rays 1-2 (3) cm long, filiform, 177 2-3 times the length of involucre, minutely black-dotted at apex; involucral bracts oblong-lanceolate, 3-5 (6) mm long, acute, auriculate at base, greenish; calyx narrowly tubular-cylindric, parted to about 1/3 into subtriangular pointed declinate teeth, densely dotted with black glands; corolla tube twice the length of the calyx, expanded into a limb 3-4 (5) mm across, the lobes obcordate bilobulate; capsule oblong, brown, exceeding the calyx, dehiscing with straight valves. May-June (Plate VII, Figures 5, 5a).

Humid meadows, spring bogs in the alpine zone, and the intermediate (juniper) altitude zone.— Soviet Central Asia: Pam.-Al. (Zeravshan, Gissar, Turkestan ranges). **Gen. distr.:** Tibetan slopes of the Himalayas. Described from Lake Iskanderkul'. Type in Leningrad.

Note. Differ from *P. sibirica* Jacq. in the smaller flowers, spatulate leaves gradually tapering into petiole, and slender sometimes almost filiform scapes. Additional characters distinguishing this plant from the other closely related species *P. pamirica* Fed., are the weak rosettes, thin slender leaves, and few-flowered inflorescences. Distinguished among all the species of the series *Sibiricae* Fed. by its small flowers and thin parts.

Economic importance. A decorative plant.

46. *P. Knorringiana* Fed. in Addenda XVII, 726.

Perennial, glabrous throughout; leaves rosulate, oblong-obovate or almost spatulate, obtuse at apex, gradually tapering into and equaling or slightly longer than the slender petiole, the blade thin, slightly sinuate-denticulate or entire, 5-8 (10) cm long, 0.7-1.5 (2) cm broad; scapes very long, rather thick and sometimes firm, 20-40 (50) cm long, 1.5-2 (3) mm thick sometimes verticillate, the rays strict, markedly unequal, 2-3 (3.5) cm long, greatly exceeding the involucre; involucral bracts oblong-lanceolate, subulate-tipped, 4-5 (7) mm long, distinctly auriculate at base, green; flowers small, white, orange at throat; calyx tubular, urceolate-cylindric, parted to about one-third into pointed recurved teeth, green; corolla tube half as long again as the calyx, the small limb 0.5-0.7 cm across, the obovate lobes deeply bilobulate; capsule oblong, brown, about as long as the calyx, dehiscing with apex by nearly straight teeth. July (Plate VII, Figure 3).

Humid meadows in mountains.— Soviet Central Asia: Tien Shan. Described from Terskei Ala Tau Range (above Tekes valley). Type in Leningrad. Apparently endemic for the Tien Shan area.

178 Note. Somewhat resembling *P. Iljinskii*, but distinguished by its robust growth, the very long and stout scapes, large leaves, and the white corolla with orange throat. The coloration of the corolla distinguishes this species from all the other species of the series *Sibiricae*.

47. **P. pamirica** Fed. in Addenda XVII, 724.— *P. sibirica* auct. Fl. turkest. p.p. non Jacq.

Perennial, efarinose, glabrous; leaves commonly forming dense rosettes, obovate-spatulate, round-tipped or subacuminate, gradually (not abruptly) tapering into a long winged petiole, rather thick or even subcoriaceous, 3-5 (7) cm long, 0.6-0.7 (1.5) cm broad; scapes elongated, 15-20 (30) cm long, stoutish, faintly striped, greatly increasing in length and thickness after anthesis; umbel dense, many-rayed, the rays unequal, 1-2 (5) cm long, 1 1/2-2 times the length of the involucre, minutely dotted with black glands below the apex; involucre bracts oblong, 7-10 (12) cm long, mucronulate, auriculate at base, glandular-punctulate; calyx tubular, parted to one-third into mucronate somewhat recurved teeth densely dotted with black glands; corolla tube twice the length of the calyx, enlarged into a pale rose limb 1.5-2 cm across, the obcordate lobes deeply bilobulate; capsule oblong, dehiscing with apex into acutish teeth; seeds castaneous, irregularly angular. May-July (Plate VII, Figure 4).

High-mountain meadows, marshy meadows in the valley of mountain streams, and on grassy mounds.— Soviet Central Asia: T. Sh., Pam.-Al. (except Zeravshan, Gissar and Turkestan ranges). Described from Pamir (Lake Kara-Kul'). Type in Leningrad.

Note. Clearly distinguishable from *P. sibirica* Jacq. by the stout, firm, many-flowered scapes, the dense rosettes, the rather thick and sometimes subcoriaceous leaves with blades gradually tapering into petiole, and involucre bracts and calyx densely punctulate with minute black hairs. Also differing markedly from *P. Iljinskii* Fed. in the firm stoutish scapes, the large flowers, and the few-rayed inflorescence, and from *P. Knorringiana* Fed. in lower growth and the large violet-rose flowers (as opposed to the white yellow-throated flowers of *P. Knorringiana*).

- 181 Series 8. **Longiflorae** Fed.— Leaves strongly white-farinose beneath, gradually tapering into a broadly winged petiole or sessile; calyx long-cylindric; corolla tube strongly elongated, both tube and limb dark violet; pedicels shorter than the calyx.

48. **P. Halleri** J. F. Gmel. in Onomatolog. botan. complet. VII (1775) 407; Schwarz in Mitt. Thüring. Bot. Vereins, XLII, 105; W. W. Sm. and Fletch. in Trans. Roy. Soc. Edinb. LXI, 1, 66, in obs.— *P. longiflora* All. Fl. Pedemont. I (1785) 92; Lehm. Monogr. Primul. (1811) 49; Duby in DC. Prodr. VIII, 45; Pax in Engl. Bot. Jahrb. X (1889) 201; Velenovsky, Fl. Bulg. 477; Pax in Engl. Pflanzenr. IV, 237, 87; Hegi, Ill. Fl. V (1927) 1758.— *Aleuritia longiflora* Opiz in Berchtold. Oekon. Techn. Fl. Böhm. II (1838-1839) 196.— Ic.: All. l.c. tab. 39 (sub nom. *P. longiflora*); Rchb. Ic. Fl. Germ. XVII, tab. 1092; Schlecht. Langenth. u. Schenk, Fl. Deutschl. XIX, tab. 1965; Hegi, l.c. f. 2755; Javorka es Csapody, Ic. Fl. Hung. tab. 28.— Exs.: Domin et Krajina, Fl. Čechoslov. exs. No. 190 (sub nom. *P. longiflora*); Rehm. et Woloszczak, Fl. pol. exs. No. 245; Herb. Mus. Nat. Hung. Budapest, No. 365; Rchb. Fl. Germ. exs. No. 458.

Perennial; rootstock short, with tufts of rather thick whitish roots; leaves sessile or short-petioled, oblong-obovate, elliptic or oblanceolate, obtuse or round-tipped, cuneate at base, almost entire or obscurely denticulate, green above, densely yellowish-farinose beneath with a



Plate VIII

1. *Primula Fedtschenkoi* Rgl. 2. *P. flexuosa* Turkev. 3. *P. cuneifolia* Ldb., 3a) calyx with capsule. 4. *P. Olgae* Rgl., 4a) calyx with capsule, 4b) involucre. 5. *P. Warshenewskiana* B. Fedtsch., 5a) calyx with capsule, 5b) leaf.

prominent rather thick midrib and faint thin lateral veins; scapes fairly stout, up to 2 mm thick, 8-18 cm long, elongating in fruit up to 30 cm, slightly yellowish-farinose below the apex; umbel 2-12-flowered; involucre bracts 5-10 mm long, narrowly lanceolate, acute, yellowish-farinose, with rather small auricles at base; pedicels 5-10 mm long, elongating in fruit up to 2 cm, erect, slightly farinose; calyx 8-12 mm long, tubular to tubular-campanulate, prominently 5-nerved, slightly farinose, violet, the lanceolate or oblong, obtusish or subacuminate teeth as long as the tube; corolla violet, the tube up to 2-3 cm long, 2-3 times the length of the calyx, the broad limb up to 2 cm across, the obcordate lobes deeply bilobulate; capsule cylindric, equaling, or slightly exceeding the calyx. May (Plate VII, Figure 8).

Stony alpine meadows, chiefly on calcareous ground. In the Carpathians (within the USSR) often growing together with *Festuca amethystina* and *Carex sempervirens*. — European part: U. Dns. (Carpathians: Svidovetz Mts., Mt. Cherna, Mt. Bliznetsy). **Gen. distr.:** Centr. and E. Europe: E. and W. Alps, Carpathians; mountains of Croatia, Bosnia, Albania, Serbia*, and Bulgaria. Described from the Alps of the Piedmont region**. Location of type unknown.

Note. Reported by N.I. Kuznetsov (Mat. dlya Fl. Kavk. IV (1901) 112) for the part of Turkish Armenia bordering on the Caucasus, on the basis of Ladovskii's specimens; it seems, however, that these specimens are false as are nearly all his Caucasian collections.

Economic importance. One of the most beautiful species of primrose, widespread in European horticulture since 1818 when it was introduced into England. Suitable for rockery cultivation in gardens and parks.

Section 6. **OREOPHLOMIS** Rupr. in Bull. Acad. Sc. Petersb. IV (1863) 276. — *Auriculatae* Pax in Engl. Bot. Jahrb. X (1889) 185, ex p. — *Farinosae* Pax in Engl. Pflanzenr. IV, 237 (1905) 70, ex p. — Subsect. *Auriculatae* W.W. Sm. and Fletch. in Trans. Roy. Soc. Edinb. LXI, 1 (1944) 57, ex p. — Calyx terete; capsule subglobose, barely exceeding the calyx; seeds pointed at both ends; corolla with a flat or somewhat funnellform limb and biparted lobes; involucre bracts always auriculately saccate at base; inflorescence a many-flowered umbel. Plants slightly farinose or bare. — Section type: *P. auriculata* Lam.

Series 1. **Warshenewskianae** Fed. — Flowering scapes very short, the inflorescence often not exceeding the rosette leaves; scapes elongating in fruit, but not exceeding 15 cm; leaves sharply serrate or spinulose-serrate, in dense rosettes; inflorescence few-flowered, loose; rosettes not fibrillose at base. A vicarious species — *P. rosea* Royle in the Himalayas.

49. ***P. Warshenewskiana*** B. Fedtsch. in Tr. Bot. Muz. AN, I (1902) 149; Turkev. in Fl. Az. Ross. I, 30; W.W. Sm. and Fletch. in Trans. Roy. Soc. Edinb. LXI, 1 (1944) 65. — *P. radicata* Balf. f. et W.W. Sm.

* [Croatia and Serbia are constituent republics of Yugoslavia; Bosnia is the northern part of the constituent republic of Bosnia and Herzegovina.]

** [Large area, mainly in NW Italy, small part in France since 1947.]

in Not. Roy. Bot. Gard. Edinb. IX (1916) 195.— *P. rhodantha* Balf. f. et W.W. Sm. l.c. (1916) 39.— *P. rosiflora* Balf. f. et W. W. Sm. l.c. (1916) 41.

183 Perennial; rootstock abbreviated, with a tuft of thin whitish roots; plants small, up to 10 cm tall; leaves oblong-obovate or lanceolate, round-tipped or slightly acuminate, sinuate-dentate or subspinulose-dentate, cuneate at base, subsessile or gradually tapering into a short winged petiole, glabrous on both sides, together with petiole 1.5-7 cm long; flowering scape commonly equaling or shorter than the leaves and thus inflorescence appearing subradical, elongating in fruit up to 15 cm; umbel 1-2-4 (7)-flowered; involucre bracts lanceolate, declinate in fruit, auriculate; pedicels slender, 2-3 times the length of the involucre, elongating in fruit up to 2.5 cm long; calyx small, campanulate, 4-5 mm long, almost round tube, the lanceolate acute somewhat divergent teeth as long as the tube; corolla rose, rather large, 8-12 mm across, the cordate lobes deeply notched; corolla tube 10-13 mm long, funnelform-dilated at throat, 2-3 times the length of the calyx. July (Plate VIII, Figures 5, 5a, 5b).

The alpine zone, in humid meadows near springs and brooks.— Soviet Central Asia: Pam.-Al. (Shugnan, Vakhn, Darvaz). Gen. distr.: Ind.-Him. (Chitral, Kuram Valley). Described from Shugnan (Pyandzh and Gunt river valleys). Type in Leningrad; one of the isotypes in Edinburgh.

Series 2. **Auriculiferae** Fed.— Scares long, very strongly elongating after anthesis; leaves serrate, sharply dentate or almost entire; inflorescence a dense, commonly many-flowered spherical umbel; rosettes without fibrillose remnants of old leaves.

50. ***P. auriculata*** Lam. Illustr. Gen. I (1791) 429; id. Encycl. Method. V (1804) 619; Duby in DC. Prodr. VIII, 38, ex. p.; Rupr. in Bull. Acad. Sc. Petersb. VI, 226; Rgl. in Tr. Bot. Sada, III, 145; Kuzn. in Mat. Fl. Kavk. IV, 104 (cum f. *typica* et f. *glacialis*); Pax in Engl. Pflanzenr. IV, 237, 74, ex p.; W.W. Sm. and Fletch. in Trans. Roy. Soc. Edinb. LXI, 1 (1944) 58, ex p.; Boiss. Fl. or. IV (1879) 28, ex p.; Somm. et Lév. in Tr. Bot. Sada, XVI (1900) 334.— *P. auriculata* var. *caucasica* Ldb. Fl. Ross. III (1847-1849) 12.— *P. longifolia* Curtis Bot. Mag. IV (1797) 392; Lehm. Monogr. Primul. (1817) 50.— *P. farinosa* var. *longifolia* C. Koch in Linnaea, XVII (1843) 367.— *P. pycnorhiza* Ldb. Fl. Ross. III (1847-1849) 11.— *P. macrophylla* C. Koch, l.c. 615.— *P. nivalis* Ad. ex Rupr. l.c. 228, non Pall.— *P. glacialis* Ad. ex Rupr. l.c. 228.— *P. auriculata* var. *Bornmülleri* Hauskn. et Bornm. in Mitt. Thüring. Bot. Vereins, XX (1905) 38.— *P. Bornmülleri* Hauskn. in sched.— Ic.: Ldb. Ic. Fl. Ross. III, tab. 243; Rgl. Gartenfl. XXIII, tab. 802; Grossg. and Dolukh. Rast. letn. pastb. Gandzh. (1929) Plate 5; Rgl. l.c. XII (1863) tab. 391 (sub. *P. pycnorhiza* Ldb).— Exs.: Sint. Iter or. No. 4116; Bornm. Bithyn., Galat. Paphlag. pl. exs. No. 14382; Fl. cauc. exs. No. 240; Herb. Fl. Cauc. No. 342; A. et V. Brotherus, Pl. cauc. Nos. 729, 730, 731; Somm. et Lév. Iter. cauc. No. 911.

184 Perennial; rootstock short, fairly thick, vertical, sometimes surrounded at base by brown remnants of dead leaves and bearing fairly thick stringy brownish roots; leaves together with petiole 3-25 cm long, 2-3 cm broad, elliptic to oblanceolate, obtuse or round-tipped or slightly acuminate,

tapering into a fairly short broadly winged petiole, serrate or crenate-serrate or rarely obscurely serrulate, efarinose; scapes 8-20 (60) cm long, very slightly farinose below apex; inflorescence a spherical umbel containing up to 20 or more flowers; involucre bracts 5-10 mm long, linear-lanceolate to linear, distinctly sacculate-auriculate at base; pedicels up to 7 mm long, markedly elongating in fruit; calyx 5-7 mm long, campanulate, green, sometimes purple-striped, parted to the middle or lower down into oblong-sublanceolate obtuse or acute teeth, sometimes with a faint waxy bloom and ciliate; corolla rose or purple or bluish, yellow at throat, the narrowly cylindric tube 2-3 times the length of the calyx, the limb 1-2 cm across, the broadly obovate lobes bilobulate; style in long-styled flowers equaling the corolla tube, in short-styled flowers equaling the length of the calyx; capsule short-ovoid, equaling the calyx; seeds up to 2 mm long, elongate, angular, straight, the surface slightly reticulate. June-July.

Mountains in humid alpine meadows, often near melting snow.—Caucasus: Cisc., W. and E. Transc. **Gen. distr.:** Asia Minor. Described from the Levant (Asia Minor) from specimens grown from seed in Paris. Type not preserved.

Economic importance. A highly decorative plant, cultivated in European gardens since 1784.

Note. Specimens from the Greater Caucasus and from Georgia, described as *P. glacialis* Adams ex Rupr. and by Ledebour as *P. pycnorhiza*, and those from more recent collections, differ from the plants of Asia Minor (i.e., the topotype) in the more pronounced serration of the leaves, thick rootstock, and stout scape. Unfortunately, because of insufficiency of material from Asia Minor, it seems as yet impossible to differentiate distinct races.

51. *P. luteola* Rupr. in Bull. Acad. Sc. Petersb. VI (1863) 233; Rgl. in Tr. Bot. Sada, III, 144; Boiss. Fl. or. IV, 29; Pax in Engl. Bot. Jahrb. X, 191; Pax in Engl. Pflanzenr. IV, 237, 81; Kuzn. in Mat. Fl. Kavk. IV, 1, 108; Grossg. Fl. Kavk. III, 208; W.W. Sm. and Fletch. in Trans. Roy. Soc. Edinb. LXI, 1 (1944) 62.—*P. auriculata* var. *luteola* Rgl. in Suppl. Ind. Sem. Horti Petrop. (1868) 25.—Ic.: Rgl. Gartenfl. (1867) tab. 541; Tr. Ross. Obshch. sadov (1867), Plate 202; Forrest, Engl. Rock Garden, II, tab. 16.

Perennial, up to 70 cm tall, glabrous; rootstock thick, oblique, densely covered with thick stringy roots; leaves lance-elliptic, gradually tapering into a broad winged petiole, obtuse or slightly pointed at apex, irregularly doubly serrate-dentate, the acute teeth almost perpendicular to leaf margin (not appressed), the midrib thick, strongly convex beneath, often doubly folded-carinate or winged, the wings spreading over the entire undersurface; scapes stout, up to 0.7 mm thick at base, long; umbel many-rayed; flowers large, lemon-yellow, orange at throat; involucre bracts many, linear, up to 1 cm long; pedicels about twice the length of the involucre; calyx subcampanulate, parted to the middle into triangular-lanceolate obtusish teeth; corolla lobes obovate to suborbicular, notched, with two rounded lobules; capsule brown, ovoid, exceeding the calyx, dehiscing with oblong obtusish teeth. July.

Spring bogs of the alpine zone, and humid meadows.—Caucasus: Dag. Endemic. Described from Tushetiya and Dagestan (S. slopes of the pass between Kidero and Kituri); Type and cotype in Leningrad.

Economic importance. An outstanding ornamental plant introduced into cultivation as far back as 1867 for the beautiful flowers. F.I. Ruprecht, who described this plant, grew it himself and obtained a somewhat modified form with large calyx and described it as *f. macrocalyx* Rupr. E. Regel points out that proliferation of inflorescence often occurs in cultivation.

52. **P. Olgae** Rgl. in Tr. Bot. Sada, III, 1 (1874) 151; Pax in Engl. Pflanzenr. IV, 237, 82.—*P. auriculata* var. *calva* Hausskn. et Bornm. ex Turkev. in Fl. Az. Ross. 1 (1923) 28, ex p.; W.W. Sm. and Fletch. in Trans. Roy. Soc. Edinb. LXI, 1 (1944) 59, ex p.

Perennial; rootstock short, vertical, with a tuft of fairly thick somewhat stringy whitish roots; flowering plants very small, often not more than 5-10 cm tall, glabrous; leaves obovate-oblong, tapering into a rather short broadly winged petiole, obtuse or slightly acuminate, almost entire or irregularly crenulate-denticulate; scapes commonly twice the length of the leaves, but often equaling or shorter than the leaves in flowering plants, often very strongly elongating in fruit, 5-7-10 (30) cm long; inflorescence fairly small, rather few-flowered, compact, subcapitate because of the short pedicels, the lateral flowers mostly more strongly developed than the central ones, hence inflorescence appearing flattened at the top; involucre bracts lanceolate, acute, auriculate at base; exceeding the flowering pedicels; pedicels markedly shorter than the flowers; calyx short-campanulate, 3-4 mm long, green, often with short purple stripes; corolla lobes lanceolate, acute, about as long as the tube; flowers plate rose-lilac, the tube at least twice the length of the calyx, ca. 8 mm long, the limb up to 10-14 mm across, the lobes obcordate bilobulate.— June-July (Plate VII Figures 4, 4a, 4b).

Humid alpine meadows ("sazy")*, often near melting snow.— Soviet Central Asia: Pam.-Al., T. Sh. Described from Zeravshan Range (Sangi Dzhuman Pass). Possibly occurring in Afghanistan. Type in Leningrad.

Note. Differing from the related species *P. Tournefortii* Rupr. of Iran, Anatolia, and S. Transcaucasia, in low growth, small inflorescences, the commonly long corolla tube, relatively short leaves, and geographic isolation. The same characters distinguish *P. Olgae* from *P. auriculata*, and these two species differ also in general appearance. Some specimens of *P. Olgae* resemble small individuals of *P. Tournefortii* among the plants collected by Bornmüller on the Elburz Range. For this reason, apparently, Bornmüller frequently identified both these species as *P. auriculata* var. *calva* Hausskn. et Bornm., although this name is synonymous with *P. Tournefortii* only.

53. **P. Tournefortii** Rupr. in Bull. Acad. Sc. Petersb. VI (1863) 228.— *P. auriculata* f. *Tournefortii* Kusn. in Mat. Fl. Kavk. IV (1901) 108.— *P. auriculata* var. *calva* Hausskn. et Bornm. in Mill. Thüring. Bot Vereins, XX (1905) 39; Turkev. in Fl. Az. Ross. I, 28, ex p.; W.W. Sm. a. Fletch in Trans. Roy. Soc. Edinb. LXI, 1, 58, ex p.— Exs.: Kotschy, Th. Pl. Pers. austr. (ed. R. F. Hohenack. 1845) No. 647 (sub *P. auriculata* Lam.); id. Iter. Cilicicum No. 35, 73a, 113 (sub *P. auriculata*); Aucher-Eloy, Herbar d'Orient, No. 5237; Bourgeau, Pl. Armeniacae, No. 166 (sub *P. auriculata*); Bornmüller J. Iter Pers. alterum. No. 2156 (sub var. *calva*).

* [Russian "sazy", humid meadows in mountain and submontane regions of Soviet Central Asia.]

Perennial; rootstock short, with fairly thick stringy brown roots; plants completely glabrous; leaves oblanceolate to elongate-oblanceolate, sometimes subspatulate, obscurely and irregularly serrulate or practically entire, gradually tapering into a distinct broadly winged petiole, obtusish at apex, 10-15 (20) cm long, 1-1.5 (2) cm broad; flowering scapes about equal to 2-2 1/2 times as long as the leaves, elongating in fruit to 40-50 cm or more; inflorescence compact, subcapitate, with short pedicels, the terminal central flowers smaller than the lateral ones and thus inflorescence appearing somewhat flattened (mostly regularly spherical in *P. auriculata*); involucre bracts narrowly lanceolate, acute, partly
187 reflexed, equaling or exceeding the pedicels, auriculate at base; pedicels 1-2 (3) mm long, hardly elongating in fruit; calyx cupuliform, parted to below the middle into lanceolate acute teeth; corolla small, not exceeding 7-10 mm in diameter, the tube rather long, 2-2 1/2 times the length of the calyx, the flat limb with obcordate bilobulate lobes, violet-rose; capsule slightly exserted from the calyx, ferruginous-brown. June-July.

Humid meadows along banks of streams in the subalpine zone.—Caucasus: S. Transc. (chiefly the mountains of Armenia). **Gen. distr.:** E. part of Asia Minor, Iran. Described from Iran (Gilan Province). Type in Leningrad.

Economic importance. Suitable for use as an ornamental plant. After F.I. Ruprecht, who had established this species, it was not recognized by anyone else and it was included among the synonyms of *P. auriculata* Lam. A similar approach was adopted by the recent monographers of the genus *Primula*, Smith and Fletcher (l.c.). *P. Tournefortii* Rupr. constitutes, however, a distinct geographical race of the series *Auriculiferae*, with distribution centered in Iran (Elburz Range, mountains of Ku-Daen), in E. Anatolia (Cilician Taurus Mts., Bolkar Mts., Kars* upland) and in the mountains of the Lesser Caucasus (Kapudzhikh, Kyapaz, Agmaganskii Range**, Mt. Gyamysh).

Clearly distinguishable from *P. auriculata* Lam. by the subcapitate inflorescences with very short pedicels and also by the long and narrow almost entire leaves. Most closely related to *P. Olgae* Rgl. inhabiting the mountains of southern Soviet Central Asia.

Series 3. *Flexuosae* Fed.—Scapes slender, flexuous, long in flower and little elongating in fruit; leaves with long and slender petioles, sharply sinuate-dentate, in loose rosettes; inflorescence loose, few-flowered; rosette base surrounded by reticulate-fibrillose brown remnants of dead leaves. Vicarious species — *P. elliptica* Royle of the Himalayas.

54. *P. flexuosa* Turkev. in Bot. Mat. Gerb. Fl. Bot. Sada, II, 4 (1921) 15; Fl. Az. Ross. I, 1, 31; W.W. Sm. and Fletch. in Trans. Roy. Soc. Edinb. LXI, 1, 61.

Perennial; rootstock short, vertical or oblique, giving rise to tufts of long rather thick stringy whitish roots; leaves and scapes surrounded at base by numerous brown fibrillose remnants of petioles forming a tubular sheath; leaves thin, bright green, oblong-elliptic to obovate, long-cuneate
188 at base, round-tipped, tapering into a long narrowly winged rather slender petiole, irregularly and sharply sinuate-dentate with spreading and sometimes almost spinose teeth, the blade 5-7 cm long, 2-3 (4) cm broad,

* [Kars Province, NE Turkey.]

** [Gegamskii Range.]

the petiole equaling to often twice the length of the blade, the pubescence of the leaves consisting of short fine club-shaped glandular hairs, these more conspicuous on the underside and imparting to it a certain roughness; scape commonly twice the length of leaves, slender, somewhat flexuous, slightly covered below the apex with short club-shaped hairs, up to 30 cm long; umbel 3-10-flowered, slightly nodding; pedicels firm, ca. 5 mm long, shorter than the involucre; involucre bracts lanceolate, ca. 8 mm long, auriculate at base, the auricle covered with club-shaped hairs; calyx campanulate, parted to the middle into lanceolate spreading teeth, covered with club-shaped hairs; corolla tube narrow, whitish, 2-3 times the length of the calyx, up to 1.5 cm long, the limb up to 1 cm across, violet, the obcordate lobes bilobulate to 1/3 of the length; flowers fragrant; capsule globose, enclosed in the calyx. July (Plate VIII, Figure 2).

Grassy mountain slopes. Soviet Central Asia: Pam.-Al. (Gorno-Badakhshan Autonomous Region). Endemic. Described from Pialandvun Pass in Shugnan. Type in Leningrad.

Section 7. **MACROCARPAE** Pax in Engl. Bot. Jahrb. X (1889) 210.—Calyx mostly broadly campanulate; capsule globose or ovoid, commonly enclosed in the calyx; involucre bracts neither appendaged nor gibbous at base; leaves cuneate or orbicular, coarsely dentate at apex, firm, subcoriaceous. Commonly small plants, not more than 10 cm tall, mostly quite glabrous.—Section Type: *P. macrocarpa* Max.

55. *P. cuneifolia* Ldb. in Mem. Acad. Sc. Petersb. V (1815) 522; Duby in DC. Prodr. VIII, 39; Ldb. Fl. Ross. III, 15, p.p.; Herd. in Tr. Bot. Sada, I, 397, p.p.; Rgl. ibid. III, 150, p.p.; A. Gray, Syn. Fl. N. Amer. 2, 59, p.p.; Kjellm. in Nordensk. Vega-Exp. IV, 286; 295; Trautv. in Tr. Bot. Sada, IX, 480, p.p.; Miyabe, Fl. Kuril. IV, 249; Pax in Engl. Bot. Jahrb. X (1899) 211, p.p.; Id. in Engl. Pflanzenr. IV, 237 (1905) 112; B. Fedtsch. Fl. il. Command. 90; Turkev. in Fl. Az. Ross. I, 34, p.p.; E. Busch, in Fl. Sib. i Dal'n. Vost. IV, 77; W.W. Sm. and Fletch. in Trans. Roy. Soc. Edinb. LXI, 3, 632; Hult. Fl. Kamtch. IV, 48, p.p.; Kom. Fl. Kamch. III, 21; Hult. Fl. Aleut. Isl. (1937) 270; Sugawara, Ill. Fl. of Saghal, IV, 1519; Hult. Fl. of Alaska a. Yukon, VIII, 1269.—*P. cuneifolia* var. *Dubyi* Pax in Engl. l.c. (1905) 112; E. Busch, l.c. 79.—*P. cuneifolia* var. *elongata* E. Busch, l.c. p. 79.—*P. cuneifolia* subsp. *Dubyi* (Pax) Hult. l.c. (1937) 270.—*P. minima* Mertens, Bemerk. Fl. Koragins. in Linnaea, V (1830) 64, non L.—*l.c.*:
189 Miyoshi a. Makino, Pocket Atlas Alb. Pl. Jap. I (1901) tab. 13; E. Busch, l.c. 79; Kom. l.c. tab. 3; Sugawara, l.c. 1518.

Perennial; rootstock short, whitish; plants efarinose; leaves oval-cuneate or spatulate, coarsely dentate at apex, cuneately narrowed into the petiole, this long (var. *elongata* E. Busch) or fairly short (var. *Dubyi* Pax) or very short, ranging from 0.8 to 3.5 (6) cm, the blade 0.5-3.4 cm long, 0.6-1 cm broad; scapes commonly not more than 10 cm long, slender; inflorescence a few-flowered umbel, rarely flower solitary; involucre bracts small, subulate, 1.5-5 mm long; pedicels slender, 2-4 times the length of the involucre; calyx broadly campanulate, loosely surrounding the corolla, parted to below the middle into lanceolate acutish teeth; corolla limb 1.5 cm across, the obcordate lobes notched to the

middle, the cylindric tube 2-2 1/2 times the length of the calyx; capsule ovoid, equaling the calyx. July (Plate VIII, Figures 3, 3a).

Alpine and arctic meadows, in mountains and tundra. — Arctic: An.; E. Siberia: Lena-Kol.; Far East: Ze.-Bu., Okh., Kamch., Sakh. **Gen. distr.:** Ber. (islands of the Bering Sea, Arc. N. Am.). Described from Siberia, east of Lake Baikal. Type in Leningrad.

Note. Very variable as regards length of scape (from 2 to 20 cm), diameter of corolla (from 1 to 2 cm), breadth of leaves (up to 2 cm), shape and size of corolla lobes, and some other characters. In view of the gradual transitions between the forms it is impossible to consider even the most extreme forms as distinct species. The race from Unalaska and the Aleutian Islands, described by Léman as *P. saxifragifolia* Lehm. also shows very little distinctiveness. The indication of location of the type "in Sibiria transbaicalensi" should be understood as meaning that the plant was collected somewhere near the shores of the Sea of Okhotsk, since in Transbaikalia proper the species does not occur at all.

Economic importance. An ornamental plant.

Section 8. **CALLIANTHAE** Pax in Engl. Bot. Jahrb. X (1889) 211. — Calyx short, rounded-cupuliform; corolla with a long tube and commonly entire lobes, the limb flat or slightly incurved; capsule globose or ovoid; leaves more or less farinaceous or glabrous beneath. Section type: *P. calliantha* Franch.

56. **P. Fedtschenkoi** Rgl. in Tr. Bot. Sada, III (1874) 133; Pax in Engl. Pflanzenr. IV, 237 (1905) 119; Regel in Byull. Obshch. lyubit. estestvozn., antrop. i etnogr. XXI, 11; Pax in Engl. Bot. Jahrb. X (1889) 213; Turkev. 190 in Fl. Az. Ross. I, 1 (1923) 39; Fedch. O. and B. Perech. rast. Turk. No. 2915; W.W. Sm. and Fletch. Trans. Roy. Soc. Edinb. LXI, 1 (1944) 61. — Ic.: Regel, l.c. Plate 5; Pax, l.c. (1905) f. 33 A.

Perennial; roostock short, with a tuft of rather thick somewhat fusiform brown roots; leaves fairly thin, oblong-obovate, round-tipped or subacuminate, dentate with rounded (in type) or sharp teeth, gradually tapering into a short petiole or subsessile, 3-4-6 (12) cm long, 7-14-18 (29) mm broad, glabrous on both sides or scarcely farinose beneath; scape 8-12 cm long, elongating in fruit up to 25 cm, rather slender, glabrous; umbel fairly compact; pedicels short, erect, sometimes farinose, 3-8 mm long, elongating in fruit up to 2 cm; involucre bracts few, up to 2 mm long, lanceolate, acute; calyx small, 3-6 mm long, campanulate, parted to the middle into lanceolate acute teeth; corolla large, purplish-lilac, the flat limb 12-18 mm across, the lobes elliptic or obovate nearly entire (a distinguishing character), the narrow tube 2-3 times the length of the calyx, somewhat enlarged at throat; capsule globose, enclosed to the top by the closely adhering calyx, up to 6 mm long. March-May (Plate VIII, Figure 1).

Mountain slopes, sometimes among junipers, and along the banks of streams, at altitudes of 1000-2500 m. — Soviet Central Asia: Pam. Al. (Uzbekistan). Endemic. Described from Chupanata (or Chupan Ata) mountains. Type in Leningrad.

Section 9. **CRYSTALLOPHLOMIS** Rupr. in Bull. Acad. Sc. Petersb. IV (1863) 276.—*Nivales* Pax in Engl. Bot. Jahrb. X (1889) 205; id. in Engl. Pflanzenr. IV, 237, 98.—Calyx cylindric or cupuliform, terete; capsule exserted from the calyx; seeds large, ovaloid, angular; corolla with a rather short tube, a shallowly funnelform limb, and entire lobes; involucre bracts neither appendaged nor gibbous. Plants strongly farinose, with a commonly thick and vertical rootstock, the rosette clothed at base in hyaline or fibrillose remnants of dead leaves. Section type: *P. nivalis* Pall.

Series 1. **Nivales** Fed.—Plants large, with a stout scape, a commonly dense many-flowered inflorescence, glabrous or white- or yellow-farinose; rootstock often strong, topped by numerous hyaline-fibrillose brown remnants of leaves.

57. **P. Bayerni** Rupr. in Bull. Acad. Sc. Petersb. VI (1863) 238; Grossg. Fl. Kavk. III, 207.—*P. nivalis* var. *albiflora* Rupr. in sched.—*P. nivalis* var. *Bayerni* (Rupr.) Rgl. in Tr. Bot. Sada, III (1874) 136; Boiss. Fl. or. IV, 28; Somm. et Lév. in Tr. Bot. Sada, XVI, 334; Pax in Engl. Bot. Jahrb. X, 207; Kuzn. in Mat. Fl. Kavk. IV, 1, 113.—*P. nivalis* Pall. ex Ldb. Fl. Ross. III (1847-1849) 10, p. p.—Exs.: A. et V. Brotherus Pl. cauc. No. 732; GRF, No. 274.

Perennial; rootstock short, thick, giving rise to a tuft of thick stringy roots; leaves glabrous, elliptic-lanceolate, tapering into a broadly winged petiole, obtusish or subacuminate, crenate-dentate with irregular bluntish teeth, densely white-farinose or occasionally efarinose, the furrowed midrib convex on both sides; scapes about twice the length of the leaves, glabrous; stoutish; umbel many-flowered; involucre bracts linear, somewhat dilated and commonly brownish at base; pedicels unequal, glabrous, about twice as long as the involucre; calyx cylindric, parted to below the middle into linear-lanceolate teeth, brownish, glabrous; corolla large, white, faintly pinkish or stramineous, the comparatively short tube 1/3 as long again as the calyx, the broad limb up to 2 cm across, the broad lobes deeply bilobulate; capsule brownish, ovaloid-oblong, often more than twice the length of the calyx, dehiscing with short teeth. July.

In mountains, near perennial snow and glaciers.—Caucasus: Cisc. (Central Caucasus: Ossetia, Balkariya*, Svanetiya, Khevsuretiya). Endemic. Described from Khevsuretiya (at the source of the Arkhot R. in the Arkhot Range). Type in Leningrad.

Note. Constituting a geographically and morphologically very distinct race of the order *Nivales*, confined to the Central Caucasus.

Economic importance. An ornamental plant.

58. **P. longipes** Freyn et Sint. in Bull. Herb. Boiss. IV (1896) 141.—*P. nivalis* var. *longipes* (Freyn et Sint.) Kusn. in Mat. Fl. Kavk. IV, 1 (1901) 115; Pax in Engl. Pflanzenr. IV, 237, 103.—*P. nivalis* var. *farinosa* C. Koch in Linnaea, XXIII (1850) 617, non Schrenk.—*P. nivalis* Pall. in Boiss. Fl. or. IV (1879) 28, ex p.—Exs.: Sint. Iter. or. No. 7307 (cotypus!).

Perennial, tall, vigorous plants; leaves many, flat, elliptic-oblong to lanceolate, broad, up to 30 cm long and 4 cm rarely up to 7 cm broad,

* [Balkar — inhabited area, partly in Kabardinian — Balkar ASSR, partly in Georgian SSR.]

entire or from the middle upward bluntly crenate, obtusish or subacuminate, glabrous above, somewhat farinose beneath and densely so near the margin, tapering into a petiole 1-1.5 cm broad; scapes stout, up to 1 cm in diameter, 192 firm, exceeding the leaves, together with inflorescence up to 40 cm long; inflorescence a many-flowered umbel; involucre bracts many, linear from a triangular base obtusish, connate at base; pedicels 4-5 cm long, 3-4 (5) times the length of involucre, short-velutinous, farinose below the apex, 5-7 times as long as the calyx; calyx ovoid, greenish or faintly colored, parted to the middle, the teeth oblong-triangular acute, minutely serrulate, farinose inside and at the angles; corolla large, up to 2 cm across, violet, the tube up to 1.3 cm long, the obovate lobes scarcely emarginate; capsule about twice the length of the calyx, cylindric, stramineous; seeds oblong-elliptic, flattened. July.

Humid rocky alpine meadows, near melting snow.—Caucasus: W. Trans. ? Occurrence in Adzharia very likely. **Gen. distr.:** Bal.-As. Min. Described from Lazistan (Gumusane Province, Turkey). Type in Geneva; copy in Leningrad.

Note. A distinct Lazistan race of the series *Nivales*, vicarious in relation to the Caucasian species *P. Bayerni* Rupr. Differs from this species chiefly in its violet flowers, tall growth, and narrow bracts. The characteristics distinguishing *P. longipes* from the species of Soviet Central Asia and Middle Asia* are, among others, the almost completely glabrous inflorescence and the long pedicels.

Economic importance. An ornamental plant. One of the most beautiful species of the series *Nivalis*.

59. *P. nivalis* Pall. Reise, III (1772-1773) 723; Lehm. Monogr. Primul. 67; Bge. in Ldb. Fl. alt. I, 210; Duby in DC. Prodr. VIII; 39; Ldb. Fl. Ross. 10, ex p.; Turcz. Fl. baic.-dahur. II, 2, 225.—*P. nivalis* var. *genuina* Kryl. Fl. Alt. III (1904) 810; Pax u. Knuth, Primul. in Engl. Pflanzenr. IV, 237, 102, ex p.—*P. nivalis* var. *typica* Rgl. in Tr. Bot. Sada, III (1875) 135; Turkev. in Fl. Az. Ross. I, 1, 36; Kryl. Fl. Zap. Sib. IX, 2131; E. Buschin Fl. Sib. i Dal'n. Vost. IV, 69.—*P. crassifolia* Lehm. l.c. 91; Duby, l.c. 39.—*P. orientalis* Willd. ex Roem. et Schult. Syst. IV (1819) 785; Chamisso et Schlecht. in Linnaea, 1, 215.—Ic.: Pall. l.c. tab. G, f. 2; Lehm. l.c. tab. IX (sub *P. crassifolia*); E. Busch, l.c. 68.—Exs.: *P. Smirnov*, Pl. alt. exs. (sine numero).

Perennial; rootstock short, with thick stringy white roots; outer rosette leaves squamaceous, membranous, representing remnants of the preceding 195 year's leaves, the others oblong-lanceolate, tapering into a broad winged petiole, distinctly crenate-dentate, initially somewhat revolute, becoming flat, quite glabrous, efarinose, the midrib strongly protruding especially beneath; flowering scapes 15-20 cm long, elongating to 30-35 cm and more in fruit, glabrous, rather stout; umbel 8-12-flowered; involucre bracts numerous, linear-subulate, acute, equaling the flowering pedicels, slightly connate at base, exauriculate, greenish or blackish; pedicels strict, the outer ones drooping, in fruit 3 times the length of the involucre; calyx blackish-green but toward end of flowering brownish, deeply parted into lanceolate acute teeth; corolla rose-violet, the oblong obtuse entire lobes as long as the tube; capsule oblong, obtuse, dehiscing with 5 obtuse teeth,

* [Approximately western China and Mongolia.]



Plate IX

1. *P. xanthobasis* Fed. 2. *P. nivalis* Pall. 3. *P. Moorkroftiana* Wall. 4. *P. tschuktschorum* Kjellm., 4a) calyx with capsule. 5. *P. minima* L., 5a) leaf.

somewhat exceeding the calyx; seeds numerous, fairly large, the surface tuberculate. May-June (Plate IX, Figure 2).

Humid alpine meadows, near melting snow.—W. Siberia: Alt.; E. Siberia: Ang.-Say., Dau.; Soviet Central Asia: Dzu.-Tarb. (N.). **Gen. Distr.:** N. Mong. ? Described from "Eastern Siberia". Type in London.

Note. Spreading east as far as Mt. Sokhondo in Transbaikalia, but here and to the south displayed by *P. xanthobasis* Fed. and in Soviet Central Asia by *P. Regeliana* Fed.

Economic importance. A valuable ornamental plant, but difficult to grow.

60. *P. xanthobasis* Fed. in Addenda XVII, 727.—*P. nivalis* var. *subintegerrima* Rgl. in Tr. Bot. Sada, III (1874) 136; Kom. Fl. Kamch. III, 23; Turkev. in Fl. Az. Ross. I, 1, 36; E. Busch in Fl. Sib. i Dal'n. Vost. IV, 70.—*P. nivalis* var. *farinosa* Kryl. Fl. Alt. III (1904) 810, ex p. non Schenk.—*P. nivalis* var. *Moorkroftiana* Pax in Engl. Bot. Jahrb. ex p.—*P. nivalis* Hult. Fl. of Alaska a. Yukon, VIII (1948) 1271; non Pall. quoad pl. ex Kamtsch. et Tschuk.

196 Perennial, thickish, glabrous and slightly glandular glaucescent plants, densely clothed at the collar in tawny membranous lustrous squamaceous remnants of dead leaves and here very densely bright yellow-farinose; leaves exclusively rosulate, broadly lanceolate, acute, gradually tapering into a winged petiole, together with petiole 5-7 (10) cm long, 1.5-2 (2.5) cm broad, entire or very minutely and obscurely serrulate, revolute, sulfureous-farinose at base and sometimes on the lower surface, the midrib strong and prominent on both sides; scapes 10-15 (20) cm long, fairly stout, twice the length of the leaves, violet-black below the apex; involucre bracts rather narrow, 0.7-1 cm long, linear from a triangular base, obtusish, blackish-green, slightly shorter to somewhat longer than the pedicels; calyx tube cylindric, ca. 0.7 cm long, parted to the middle or lower down into lanceolate acute teeth, blackish or blackish-purple outside, sulfureous-farinose inside; corolla large, barely exceeding the calyx, purplish-violet (in drying), the tube enlarged in upper part and abruptly passing into a flat limb up to 2 cm in diameter, the lobes entire and round-tipped. June (Plate IX, Figure 1).

Alpine zone and tundra, near melting snow.—Arctic: Chuk; E. Siberia: Ang.-Say. (Tuva Autonomous Region), Dau.; Far East: Kamch. **Gen. distr.:** N. Mong. ? Described from Tannu-Ola Range. Type in Leningrad; cotype in Novosibirsk.

Note. Distinguishable from all other species of the section *Crystallophlomis* Rupr. by the densely sulfureous-farinose underside of its leaves, especially at base. More or less resembling the Himalayan species *P. purpurea* Royle.

Economic importance. Can be used as an ornamental plant.

61. *P. turkestanica* (Rgl.) E. A. White in Bailey, Stand. Cycl. Hort. V (1916) 2808.—*P. Regeliana* Fed. in Bot. zhurn. SSSR, XXXV, 6 (1950), 658, nomen.—*P. nivalis* var. *farinosa* Pax in Engl. Pflanzenr. IV, 237 (1905) 103, non Schrenk.—*P. nivalis* var. *longifolia* Rgl., *farinosa* Schrenk, *colorata* Rgl. in Tr. Bot. Sada, III (1874) 136.—*P. nivalis* var. *turkestanica* Rgl. in sched.—*P. nivalis* var. *turkestanica* Haage a. Schmidt in Gard. Chron. Nev. Ser. VIII (1877) 809; Ldb. Fl. Ross. III, 10 (var. *farinosa*); Turkev. in Fl. Az.

Ross. I, 1, 37, 38 (var. *farinosa* et var. *colorata*).—Ic.: Haage a. Schmidt. l.c. tab. 809; Rgl. in *Gartenflora*, XXVIII, tab. 930, f. 1.

Perennial, tall, vigorous plants, more or less white-farinose, with brownish remnants of dead leaves at base; leaves elliptic-oblong to broadly lanceolate, acute or obtuse, gradually tapering into a winged petiole, together with petiole 10-15 cm long, 2.5-3 (4) cm broad, crenate-denticulate or obscurely serrulate, sometimes almost entire, more or less white-farinose at the margin, the midrib more or less prominent on both sides and commonly tinged with pale violet or purple; scapes elongated, stoutish, mostly twice the length of the leaves, 15-20 (30-40) cm long, 2.5-3 (4) cm
197 broad; umbel many-flowered, spherical in outline, 6-7 cm in diameter, sometimes consisting of 2 distant or approximate whorls; involucre bracts narrow, linear from a lanceolate base, 1-2 cm long, blackish or dark violet, slightly farinose (under magnifying glass), somewhat shorter than the pedicels; pedicels arched, densely white-farinose; calyx dark violet or blackish, parted to 2/3 into linear-lanceolate teeth, together with tube 1-1.3 cm long; corolla purplish-violet, large, 1.5-2 cm across, the tube twice the length of the calyx enlarged at the top and passing into a funnellform limb, the elliptic lobes almost imperceptibly emarginate; capsule cylindric, stramineous, about twice the length of the calyx, with acutish teeth at the top. Fl. June-July; fr. July-August.

Alpine zone, usually near snow.—Soviet Central Asia: Dzu.-Tarb. (S.), T. Sh., Pam.-Al. (N.). Endemic. Described from Tien Shan. Type in Leningrad.

Note. This species includes the earlier established varieties *P. nivalis* var. *farinosa* Schrenk and var. *colorata* Rgl. On the other hand, a narrow-leaved and completely glabrous race occurring in Pamir, previously also included in var. *colorata* has been shown, upon closer examination, to be none other than *P. Moorkroftiana* Will. (which had been known only from the Himalayas). Some of the forms from Dzungaria with glabrous inflorescence, established by Schrenk as *P. nivalis* var. *farinosa* Schrenk, has proved to be simply *P. nivalis* Pall. (typical). This species is thus intermediate between *P. nivalis* Pall. and *P. Moorkroftiana* Wall. and it also occurs between the distribution areas of these two species, mainly in Tien Shan.

62. ***P. Moorkroftiana*** Wall. Numeric. List. pl. East India Museum (1828) No. 4988 (nomen); Duby in DC. Prodr. VIII, 37; Klatt in Journ. of Bot. VI, 120.—*P. nivalis* var. *Moorkroftiana* Watt. in Journ. Linn. Soc. XX (1884) 12; Hook. f. Fl. Brit. India, III, 490.—*P. nivalis* var. *Moorkroftiana* Pax in Engl. Bot. Jahrb. X (1899) 207, ex p.—*P. nivalis* var. *colorata* Turkev. in Fl. Az. Ross. I, 1 (1923) 38, ex p. non Rgl.—Ic.: Watt, l.c. tab. X.—Exs.: Plants of the Western Himalayas (Coll. W. Koelz) Nos. 2140, 2415h, 2508c.

Perennial, small plants, rarely more than 20 cm tall, commonly 10-15 cm; rootstock short, surrounded at the top by blackish-brown somewhat fibrillose squamaceous remnants of dead leaves; roots firm, stringy; leaves narrowly lanceolate, gradually narrowed to a short petiole, 5-10 (15) cm long, 1-1.5 (2) cm broad, subobtusely to subacute, entire, revolute throughout, glabrous, efarinose, slightly glaucescent; scapes half as long again or rarely twice as long as the leaves, 10-15 (25) cm long;
198 umbel few-flowered; involucre bracts ovate-lanceolate, acute, slightly

connate at base, toothed at the margin; flowering pedicels short, not exceeding the involucre; calyx lobes ovate-lanceolate, acute, twice the length of the tube, blackish, sometimes white-farinose within; corolla rose, the tube half as long again as the calyx; capsule barely exceeding the calyx. June (Plate IX, Figure 3).

Humid alpine meadows. — Soviet Central Asia: Pam.-Al. (Pamir). **Gen. distr.:** W. Himalayas, Tibet, Kashmir, the Hindu-Kush. Described from Ladakh (Kashmir). Type in London.

63. *P. pulverea* Fed. in Addenda, XVII, 727.

Perennial, white-farinose nearly throughout; rootstock thick, short, topped by numerous crowded blackish remnants of dead leaves; leaves forming a loose sparse rosette, oblong-lanceolate, passing into and longer than the petiole, together with petiole 10-15 (18) cm long, 1.5-2 cm broad, irregularly crenate-dentate, obtuse to subacute, white-farinose beneath and at the margins, bare above; scapes exceeding the leaves, glabrous; umbel few-flowered; involucre bracts linear-lanceolate, 3-5 mm long, half the length of the white-farinose pedicels; calyx campanulate, white-farinose, ca. 6 mm long, parted to the middle into triangular-lanceolate acute teeth; corolla tube twice the length of the calyx, the limb flat, the lobes obovate entire pale rose. August.

In wet gravel near perennial snow in mountains. — Soviet Central Asia: Pam.-Al. Endemic. Described from Pamir (Kok-Bai R. valley). Type in Leningrad.

Note. Differing from other species of the section *Crystallophlomis* in having white-farinose calyx and pedicels. Described from a single specimen. Needs additional study.

Series 2. *Arcticae* Fed. — Plants usually small, often dwarf; scapes rather slender; inflorescence commonly few-flowered, loose. Glabrous plants or merely the inflorescence whitish-farinose; rootstock short, reduced.

64. *P. tschuktschorum* Kjellm. in Nordensk. Vega Exped. I (1882) 516; Hultén, Fl. of Alaska a. Yukon, VIII, 1275. — *P. nivalis* var. *pumila* Ldb. Fl. Ross. III (1847-1849) 10. — *P. pumila* var. *Ledebouriana* E. Busch in Fl. Sib. i Dal'n. Vost. IV (1925) 75. — *P. pumila* (Ldb.) Pax in Engl. Bot. Jahrb. X (1889) 208; Id. in Engl. Pflanzenr. IV, 105; Turkev. in Fl. Az. Ross. I, 1, 38; Kom. Fl. Kamch. X, 23; E. Busch, l. c. 73, ex p. — Ic.: Kjellm. in Nordensk. l. c. I, 5, fig. ad. spec. depaup. E. Busch, l. c. 74, f. B, C.

Perennial; roots whitish; plants commonly 10-15 (20) cm tall,

199 essentially efarinose; leaves lance-spatulate, acute to subacute, irregularly dentate or entire, 5-8 cm long, 0.5-1.5 cm broad, the blade gradually passing into and as long as the winged petiole; scapes fairly stout, glabrous; inflorescence rather often many-flowered (more than 10 flowers), umbellate, mostly 3-5-flowered; involucre bracts several, narrowly lanceolate, acute; pedicels rather slender, 2-3 times the length of the involucre, 1-1.5 cm long, commonly white-farinose; calyx campanulate, loosely surrounding the calyx, 3-5 mm long, the teeth lanceolate 1.5-3 mm long greenish (rarely black), mostly white-farinose inside; corolla small, the limb not more than 0.7 cm across, rarely 1.5 cm, the conic tube up to 6-11 mm long,

the lobes entire or subspatulate; capsule cylindric, exceeding the calyx. July (Plate IX, Figures 4, 4a).

Meadows in the tundra, on the seashore, and banks of rivers and streams.— Arctic: Chuk., An.; Far East: Kamch. **Gen. distr.:** islands of the Bering Sea, Arc. Am. Described from Chukchi Peninsula (Lavrentiya Bay). Type in Stockholm.

Note. Kjellman described this species from weak, poorly developed few-flowered specimens, and thus considered the large specimens growing in the Chukchi Peninsula as representing a different species — *P. nivalis* var. *pumila* Ldb. Already Pax, after the publication of *P. tschuktschorum* by Kjellman, correctly assessed the taxonomic significance of the Chukchi primrose and named it *P. pumila* (Ldb.) Pax. The priority principle demands, however, that precedence be given to the name coined by Kjellman and to apply it to all the plants earlier related to *P. pumila*, even though Kjellman himself conceived his species more narrowly and quite wrongly. It should also be borne in mind that the description given by Kjellman fits badly the present wider conception of *P. tschuktschorum*.

65. *P. arctica* Koidzumi in Tokyo Bot. Mag. XXV (1911) 216.— *P. tschuktschorum* Kjellm. in Nordensk. Vega Exped. I (1882) 516, p.p.— *P. pumila* var. *arctica* (Koidzumi) E. Busch in Fl. Sib. i Dal'n. Vost. IV (1925) 75; Kom. Fl. Kamch. III, 24.— Ic.: E. Busch, l.c. 71, f. A.

Perennial; roots stringy, whitish; plants with farinaceous bloom confined to inflorescence; leaves oblong-lanceolate, acute to obtusish, gradually tapering into an indistinct petiole, 3-5 cm long, 0.5-0.7 cm broad, obscurely serrulate, or entire, slightly revolute; flowering scapes 7-10 cm long, fairly stout, glabrous, elongating in fruit; inflorescence few-flowered, containing 1-3 (5) flowers; involucre bracts few, lanceolate acute, blackish, 0.5-0.7 cm long; pedicels short, not exceeding the involucre, commonly efarinose; calyx cupulate, parted to 2/3 into lanceolate acute teeth, commonly black, 0.6-0.7 cm long; corolla large, up to 1.5-1.7 cm across, with a broad cylindric tube, violet; capsule about twice the length of the calyx. June.

Tundras, meadows in the tundra, seashores, rivers, and streams.— Arctic: Chuk. (islands of the Arctic Ocean, Wrangel Is.), Anad.; Far East: Kamch. Described from Chukchi Peninsula (Provideniya Bay). Type in Tokyo; topotype in Leningrad.

Note. Fairly readily distinguishable from *P. tschuktschorum* Kjellm. by its shorter flowers, the short and commonly efarinose pedicels, few-flowered inflorescence, and the large black calyx. The perfectly typical *P. arctica* is known only from the shore of Provideniya Bay (locus classicus) and from the islands of the Arctic Ocean.

66. *P. eximia* Greene in Pittonia, III (1897) 251; Hult. Fl. Kamtch. IV, 50; Takeda in Not. Bot. Gard. Edinb. VIII, 90; Pax in Engl. Pflanzenr. IV, 237, 105.— Ic.: Takeda, l.c. tab. 22.

Perennial; roots stringy, whitish or brown; plants almost efarinose, 5-10 (20) cm tall; leaves rather large, oblong-oblong-lanceolate, subacute to subobtusish, gradually tapering into a rather indistinct broadly winged petiole, obscurely and irregularly crenate-serrulate, 5-15 cm long, 1.5-3 cm broad;

flowering scapes very slightly exceeding the leaves, 2-3 times the length of the leaves, rather thick; inflorescence commonly many-flowered, rarely 2-3-flowered, rather compact, secund; involucre bracts few, lanceolate, acute, green or brownish, up to 0.7 cm long; pedicels rather short, barely exceeding the involucre, mostly efarinose, sometimes densely white-farinose; calyx cupuliform, brownish-green (not black), the lobes lanceolate, acutish, twice as long as the tube; corolla large, purple, the tube twice the length of the calyx, the lobes entire or erose. July.

On the seacoast and in humid places.— Far East: Kamch., N. part of Kurile Is. **Gen. distr.:** Ber. (Aleutian and Pribilof Is.). Described from St. Paul Is. in the Bering Sea. Type in one of the herbariums of North America; topotype in Leningrad.

Note. Contrary to Turkevich's reports, *P. eximia* Greene apparently occurs in Kamchatka, as confirmed by Hultén's collections (from Cape Lopatka). The specimen from Hultén's collections preserved in Leningrad resembles in its characters *P. arctica* Koidzumi. *P. eximia* is undoubtedly related to *P. tschuktschorum*, but is large, with long leaves and a one-sided inflorescence; distributed mainly in the islands of the Bering Sea.

- 201 Hultén (Fl. of Alaska a. Yukon, VIII (1948) 1275) considers *P. eximia* as merely a synonym of *P. tschuktschorum*. It is, however, more appropriate to separate these species on the basis of the characters we have indicated.

Subgenus 2. **AURICULASTRUM** Schott in Sippen d. österr. Prim. (1851) 11; emend. Rupr. in Bull. Acad. Sc. Petersb. IV, 218.— Leaves involute in veneration, coriaceous or somewhat fleshy, at length becoming flat; calyx short, rounded-cupuliform; capsule subglobose, enclosed in the calyx; inflorescence few-flowered or flowers solitary; corolla with or without folds in throat, bare or glandular. Plants with a horizontal or oblique often branched rootstock, nearly always glabrous except for the inside of corolla.

Section 10. **CHAMAECALLIS** Schott, Sippen d. österr. Prim. (1851) 13.— Calyx short, with broad rounded teeth; corolla glandular-pubescent in the throat; capsule globose; flowers solitary or paired; scapes very short, mostly shorter than the leaves; leaves cuneate, coarsely toothed at apex, coriaceous; rootstock branched. Plants compactly pulvinate, quite glabrous. Section type. *P. minima* L.

67. *P. minima* L. Sp. pl. (1753) 143; Lehm. Monogr. Primul. 85; Koch, Synops. Fl. Germ. I, 590; Duby in DC. Prodr. VIII, 39; Boiss. Fl. or. IV; 31; Simonkai, Enum. Fl. Transsylv. 460; Pax in Engl. Bot. Jahrb. X, 231; id. in Engl. Pflanzenr. IV, 237, 146; Sagorski a. Schneid. Fl. Central-Karp. 362; Velenovsky, Fl. Bulg. 479; Popov, Rast. i Fl. Karpat (1949) 222; W.W. Sm. and Fletsch. in Trans. Roy. Soc. Edinb. LXI, 3, 672.— *P. Saulteri* Schultz in Flora, XIX (1836) 123.— *Aretia minima* Link, Handb. II (1829) 413.— *Kablikia minima* Opiz in Berchth. Fl. Boehm. II (1838) 216.— Ic.: Rchb. Ic. Fl. Germ. XVII, tab. 1100, 1104; Schlecht. Langenth. u. Schenk, Fl. Deutschl. ed. 5, XIX,

tab. 1981; Pax in Engl. Pr. Pflanzenf. IV, f. 61; Pax in Engl. Pflanzenr. IV, 237, f. 38; Hayek, Pflanzenr. Oestern. Ung. I, tab. 3 et tab. 32; Hegi, Ill. Fl. V, 3, tab. 209, f. 2782-5; Javorka et Ssapody, Ic. Fl. Hung. f. 2664.— Exs.: Fl. exs. Austro-Hung. No. 1391; Schultz et Winter, Herb. norm. Cent. 2, No. 134; Hayek, Fl. Stir. exs. 6, No. 291; Rchb. Fl. Germ. exs. No. 1927; Fl. Hung. exs. Centr. 1, No. 70; Sieber, Pl. Austr. No. 62; Günth et Schum. Herb. Sel. Cent. VI, No. 62; Herb. Primul. Leo Derganc (sine numero).

Perennial; rootstock short, thick, branched, covered with fibrillose brown remnants of dead leaves, most profusely at the base of leaf rosettes; plants minute, commonly 3-5 (7) cm tall; leaves 0.5-3 cm long, 0.3-0.8 cm broad, lustrous, subcoriaceous, firm, glabrate, cuneate or obtriangular, obtusely truncate and coarsely toothed at apex, gradually tapering into an indistinct petiole, rosulate, gathered in compact cushions; scapes short, often shorter than the leaves, bearing 1-2 flowers; involucre bracts 1-2, linear, obtuse; pedicels very short or lacking, elongating in fruit up to 5 mm; calyx covered with sessile glands, 6-9 mm long, parted to 1/3 or lower down into obtuse or round-tipped or mucronulate teeth; corolla rose or white, the white tube exerted from the calyx, 5-11 mm long, glandular in the funnelform throat, the flat limb 1.6-3 cm across, the obovate lobes deeply notched; capsule enclosed in the calyx. June-July (Plate IX, Figures 5, 5a).

Stony alpine meadows and rocks.— European part: U. Dns. (Carpathians: Mt. Chernaya, Mt. Pop-Ivan). **Gen. distr.:** Tatra, Sudetes, Balkans, Transylvanian Alps, mountains of N. Italy. Described from Europe, Type in London.

Economic importance. A beautiful ornamental plant, cultivated in rockeries in the botanical gardens of W. Europe. The plant is rather difficult to grow. A recommended soil mixture consists of two parts of "heath soil" to one part of river sand and crushed brick.

Genus 1115. **SREDINSKYA** * (STEIN.) FED. **

Fed. in Bot. Mat. Gerb. Bot. inst. AN SSSR, XIII (1951) 201.— Sredinskya Stein. (pro sect.) in Samenkatalog des Breslauer bot. Gartens (1881).

Corolla tubular-cylindric, parted to the middle or lower down, the oblong-linear lobes somewhat enlarged toward apex and slightly emarginate, divided by broad sinuses, these nearly square at base; calyx campanulate, the subacute teeth shorter than the tube; ovary globose; style long, much exerted, filiform, the stigma inconspicuous; stamens inserted in the corolla throat, opposite the lobe, the filaments short conic; anthers bilocular, basifixed; capsule ovoid, dehiscing with apical biparted teeth; seeds angular, minutely tuberculate.

The genus *Sredinskya* is monotypic, endemic, consisting of the one species described below.

1. **S. grandis** (Trautv.) Fed. l.c. 202.— *Primula grandis* Trautv. in Bull. Acad. Sc. Petersb. X (1866) 395; Rgl. in Tr. Bot. Sada, III, 131; Boiss. Fl. or. IV, 27; Pax in Engl. Bot. Jahrb. X (1899) 215; Lipskii,

* Named after the Kharkov botanist N. K. Sredinskii, one of the first collectors of this plant.

** Arranged by An. A. Fedorov.

Fl. Kavk. (1899) 384; Somm. et Lévl. in Tr. Bot. Sada, XVI, 333; Kuzn. in Mat. Fl. Kavk. III (1901) 116; Tr. Bot. Sada Yur'evsk. Univ. II, 204; Pax in Engl. Pflanzenr. IV, 237 (1905) 122; Medv. Rastit. Kavk. I, 2, 349; W.W. Sm. and Fletch. in Trans. Roy. Soc. Edinb. LXI, 2, 468; Grossg. Fl. Kavk. III, 205; Kolak. Fl. Abkh. III, 266. — Ic.: Rgl. in Gartenfl. XXVIII, tab. 968; Hemsley in the Garden, XV, 349; Robinson, Engl. Fl. Gard. (1883) tab. 209; Pax, l.c. (1905) f. 35; W.W. Sm. et Forrest in Journ. Roy. Hort. Soc. LIV, f. 22; Fed. l.c. f. 1. — Exs.: GRF, No. 1335 (sub *Primula*).

Perennial, essentially efarinose, tall, strong plants, the rather long rootstock 1-2 cm thick, topped by numerous radical leaves and leaf remnants; leaves together with petiole up to 30 cm long, the blade 3.5-12 cm long and 3.5-10 cm broad, broadly ovate to suborbicular, round-tipped, passing into petiole from a cordate base, crenate or crenate-dentate, bare or slightly farinose above, more strongly so especially on the veins, the lateral veins 5-8 pairs inconspicuous above and prominent beneath; petiole 5-20 cm long, distinctly winged especially at apex, dilated at base into a sheath; scapes 30-65 cm long, erect, glabrous, slightly creamy-farinose below the 15-40-flowered umbellate inflorescence; involucral bracts 4-7 mm long, lanceolate, acute or mucronate, slightly farinose or at least waxy-glandular; pedicels 2-7 cm long, weak, often arched and pendent, slightly farinose, becoming erect in fruit; calyx 6-9 mm long, slightly farinose; corolla pale yellow or whitish, 1 1/2-2 times the length of calyx. June-July (Plate X, Figures 3, 3a).

Humid alpine meadows and banks of mountain streams. — Caucasus: Cisc. (Kabardian ASSR), W. Transc. (Abkhaz ASSR, Svanetiya*). Endemic. Described from Svanetiya (Dadiash Mts.). Type in Leningrad.

Economic importance. Sometimes grown in gardens as an ornamental plant.

Genus 1116. **KAUFMANNIA** ** Rgl.†

Rgl. in Tr. Bot. Sada, III, 2 (1875) 293.

Calyx campanulate-tubular, 5-parted; corolla tube cylindric, about as long as the calyx; corolla limb deeply 5-parted, short, with flat-spreading teeth (i. e., nearly flat) or 2-3 times as long as the limb with elongate erect oblong obtuse lobes and thus corolla narrowly campanulate; stamens 5, inserted in the throat, the filaments connate into a more or less thickened ring; anthers bilocular, lance-oblong from a cordate base, acuminate, exserted or in the case of long corolla limb included in the flower; style long, filiform, twice the length of corolla and much exserted; capsule dehiscent with 5 apical teeth, many-seeded; involucral bracts broad, foliaceous, obovate-cuneate, irregularly erose-denticulate at apex; inflorescence umbellate, with rays of equal length; leaves with a rounded-reniform lobed-dentate blade and a long almost wingless petiole.

An oligotypic genus with two species distributed through northern Soviet Central Asia.

Note. The genus *Kaufmannia* is distinguished by striking dimorphism of flowers. Flowers with a short horizontally spreading corolla

* [Area in NW Georgian SSR.]

** Named by E. Regel for the Turkestani governor-general Kaufman.

† Arranged by An.A. Fedorov.

are characteristic of *K. Semenovii* (Herd.) Rgl. (generic type) and have only been observed in two specimens of this species (type and cotype), collected by P. P. Semenov in the Trans-Ili Ala Tau. *Kaufmannia* with such flowers has never been collected before. All herbarium specimens, subsequently collected by various people, had flowers with a long narrowly campanulate corolla. On this ground, A. A. Lozina-Lozinskaya described another species of the genus — *K. brachyanthera* A. Los. For the present, following Lozina-Lozinskaya, we distinguish two species of the genus *Kaufmannia*, although there are grounds for assuming that the two original specimens (*K. Semenovii* type) represent a relatively rare morphologic deviation, and that the typical form, in the proper sense of the word, is *K. brachyanthera*. Should this be proved by further studies, the two species would have to be combined under supplementary description and be named, in conformity with priority rules, *K. Semenovii* (Herd.) Rgl.

1. Corolla short, shorter than to equaling the calyx, horizontally spreading, almost flat; anthers exserted. 1. *K. Semenovii* (Herd.) Rgl.
- + Corolla long, 2-3 times the length of calyx, narrowly campanulate, enclosing the anthers 2. *K. brachyanthera* A. Los.

- 207 1. *K. Semenovii* (Herd.) Rgl. in Tr. Bot. Sada, III, 2, (1875) 293; A. Los. in Tr. Bot. inst. AN SSSR, Ser. I, 3, 252. — *Cortusa Semenovii* Herd. ex Rgl. et Herd. in Bull. Soc. Nat. Mosc. 3 (1867) 63; Knuth in Engl. Pflanzenr. IV, 237, 222. — *C. Matthioli* subsp. *Semenovi* Vved. in Sched. ad H. F. A. M. XII (1927) No. 284. — *C. Matthioli* Lipsky in Tr. Bot. Sada, XVIII (1900) 85, non L. — *C. sulphurea* Semenov in sched. — Ic.: Fedch. in Bot. Mat. Gerb. Bot. inst. AN SSSR, XIII, 200 (flos).

Perennial; rootstock bearing brownish stringy roots; leaves exclusively subradical, long-petioled, the petioles beset with spreading hairs, 9-15 cm long, more than twice the length of the blade; leaf blades rounded-reniform, lobed-dentate, glabrous except for the hairy veins on both sides; scapes slightly exceeding the leaves, beset with spreading hairs; inflorescence umbellate, with rays of equal length; involucre bracts initially equaling the pedicels, finally less than half as long, palmately obovate-cuneate, erose-denticulate at apex; pedicels glandular-pubescent, ca. 1.5 cm long in flower, slightly nodding at the end, 2-3 cm long in fruit; calyx glandular-pubescent, 5-parted, the lanceolate lobes shorter than the tube; corolla pale yellow, the tube barely shorter than the calyx; corolla limb short, the lobes oblong-ovate, obtuse, spreading; anthers and style exserted; capsule ovoid, July (Plate X, Figure 5).

Alpine zone. — Soviet Central Asia: Tien Shan (N.) Endemic. Described from Trans-Ili Ala Tau, from Shaty Pass. Type and cotype in Leningrad.

Note. There are no specimens in the herbarium other than the authentic ones.

2. *K. brachyanthera* A. Los. in Tr. Bot. inst. AN SSSR, Ser. I, 3 (1936) 251. — *Corthusa Matthioli* var. *Semenovii* B. Fedtsch. in sched. — *C. Semenovii* Krassn. (non Herd.) in sched. — *Kaufmannia Semenovii* Lipsky (non Rgl.) in sched.

Perennial, up to 35 cm tall; leaf petioles slender, long, 2-3 times the length of the blade, beset with spreading hairs; leaf blades rather thin,

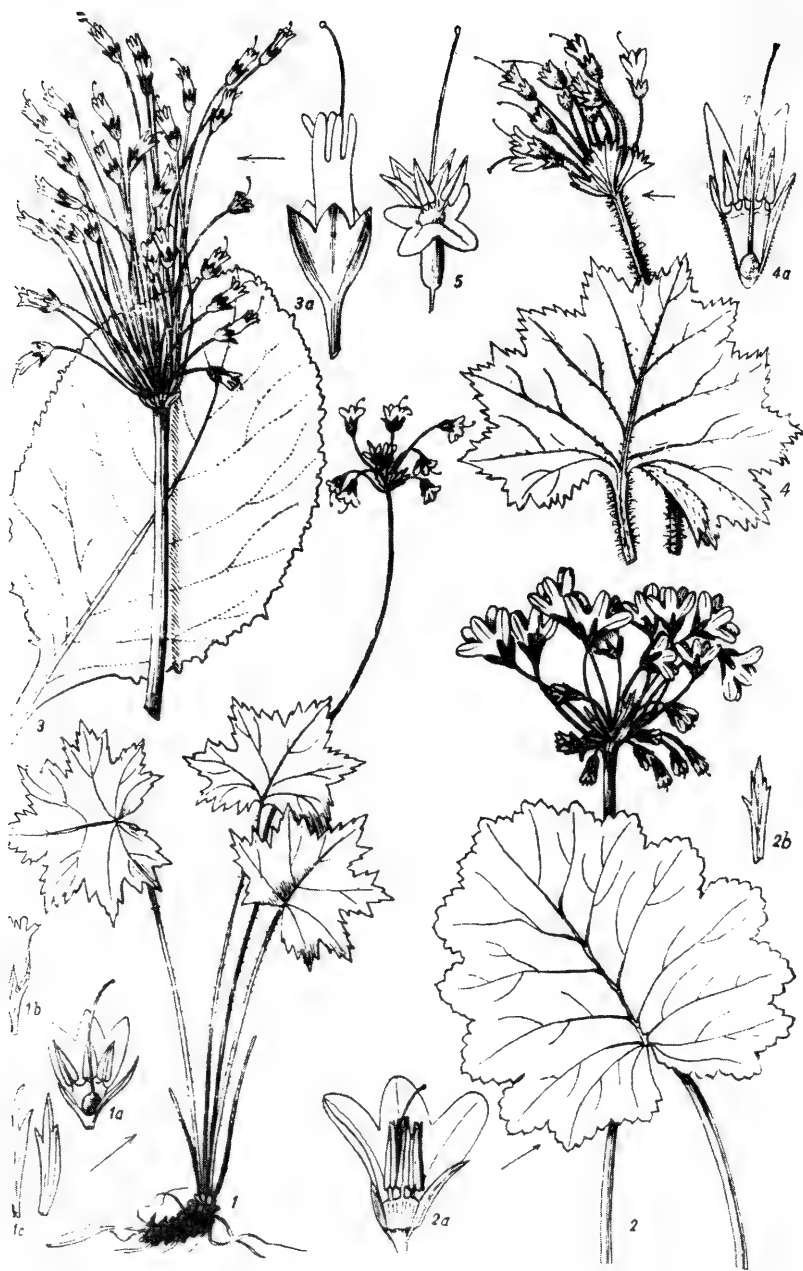


Plate X

1. *Cortusa pekinensis* (Al. Richter) A. Los., 1a) flower in section, 1b) calyx with capsule, 1c) involucral bracts. 2. *C. turkestanica* A. Los., 2a) flower in section, 2b) involucral bracts. 3. *Sredinskya grandis* (Trautv.) Fed; 3a) flower. 4. *Kaufmannia brachyanthera* A. Los., 4a) flower in section. 5. *K. Semenovii* (Herd.) Rgl., flower.

pale green above, bright green beneath, broadly ovate or rounded-reniform, lobed-dentate, cordate at base, up to 10 cm across, the triangular-oval lobes doubly dentate; scapes densely hairy, the hairs spreading and in upper part glandular; inflorescence umbellate, compact, containing 15 flowers; involucre bracts palmately obovate-cuneate, erose-denticulate at apex; pedicels 1-3 cm long, glandular-pubescent, slightly nodding at the end; calyx glandular-pubescent, tubular-campanulate, the lanceolate acute teeth somewhat shorter than to equaling the tube; corolla pale yellow, tubular-funnelform or narrowly campanulate, the limb much longer than the tube, the tube equaling the calyx; anthers not exerted; style much exerted; capsule ovoid-ovaloid, slightly longer than the calyx. June-July (Plate X, Figure 4).

Slopes in the forest zone. — Soviet Central Asia: Dzu.-Tarb., T. Sh. (Borborousun, Terekty Sai, Borgaty Pass, Khanakhai near Kuldja, Muzart R., Zaganussu). Endemic. Described from Ili R. valley (Kuldja Ravine). Type in Leningrad.

Genus 1117. **DIONYSIA** * FENZL. **

Fenzl in Flora, I, 24 (1843) 389. — Gregoria Duby in DC. Prodr. VIII (1844) 45. — Primula Kuntze, Rev. Gen. I (1891) 387, ex pte.

Flowers 5-merous, sometimes dichogamous, yellow (sometimes yellow in drying), rarely violet, mostly solitary, terminal, subsessile, with 2-3 renovation buds below the flowers, rarely inflorescence containing 2-5 pedicellate flowers borne on peduncles; bracts 1-3, lanceolate to linear, entire, rarely 3-5, denticulate, forming an involucre at the base of the umbel; calyx deeply parted to 3/4 the length or nearly to base, campanulate or cupuliform, persistent in fruit; corolla tubular-nail-shaped, the tube elongate-cylindric, 4-6 times or rarely 2-3 times the length of the calyx, often somewhat curved or abruptly enlarged at the middle of part below the throat, without scales at the throat, glabrous, the ovate or obcordate lobes entire or emarginate; stamens subsessile; style filiform, the stigma globose-capitate; ovules few, rarely numerous; fruit a unilocular capsule, globose or ovoid, dehiscing down to base by 5 valves, glabrous; seeds 1-4, rarely up to 15, very small, brown or black, ovoid or subglobose, carinately angular, finely rugose-reticulate or minutely papillose. Pulvinate or cespitose subshrubs, with crowded columnar forking branches, densely covered with appressed imbricated leaves, rarely branchlets with leaf rosettes and with alternate leaves on internodes; leaves small, sessile, entire or denticulate, flat or revolute, covered with glandular or rarely simple hairs.

A genus of Iran and Soviet Central Asia, containing 24 species distributed through the high-mountain areas of Turkmenistan, W. Pamir-Alai, Iran, Iraq, and Afghanistan. Four species occur in the USSR.

1. Flowers solitary, subsessile; pedicels 1-2 mm long; bracts 1-2, small, lanceolate, entire; leaves entire. 2.
- + Flowers 2-5 in peduncled umbels, pedicellate or sessile; bracts 2-5, oblong-spatulate, toothed or suborbicular, deeply cleft into large unequal teeth; leaves denticulate. 3.

* Apparently derived from the name of the god Dionysus of the ancient Greeks.

** Arranged by L. A. Smol'yaninova.

2. Corolla yellow, glabrous; leaves spatulate 1. *D. tapetodes* Bge.
- + Corolla brownish-violet, slightly pubescent; leaves ovate or obovate.
 2. *D. Kossinskyi* Czerniak.
3. Bracts spatulate-oblong, resembling the leaves in shape and size,
 denticulate; leaves with 4 or 5 large teeth on either side; corolla yellow.
 3. *D. hissarica* Lipsky.
- + Bracts suborbicular, deeply dissected into large unequal teeth, larger
 than the leaves; leaves with 3-5 small crenulations at apex; corolla
 pale violet 4. *D. involucrata* Zapr.

Section 1. **BRYONANTHE** Smoljan. sect. n. in Addenda XVII, 728.—

Flowers solitary, subsessile, the pedicels 1-2 mm long; bracts 1-2, small, lanceolate or linear, entire; ovules few, 2-6; seeds very small, 0.75-1.5 mm long; leaves entire, rather thick, faintly aromatic. Compactly pulvinate plants.

The section *Bryonanthe* contains 8 species of the genus *Dionysia*, distributed through the mountains of Turkmenistan, Iran, and Afghanistan. The species of this section differ from the others in general aspect, the entire leaves, and the shape of bracts.

1. *D. tapetodes* Bge. in Bull. Acad. Sc. Petersb. XVI (1871) 562; Boiss. Fl. or. IV, 21.—*Primula tapetodes* Ktze. Rev. Gen. I (1891) 400.—Ic.: Bornm. in Bull. Herb. Boiss. 2 ser. IV, 521, pl. 3; Knuth in Engl. Pflanzenr. IV, 237, 162, tab. 2.—Exs.: GRF, No. 470.

A compactly pulvinate subshrub; branches short, columnar, crowded, forking, densely covered with imbricated appressed leaves; leaves small, 210 2-4 mm long and 1-1.5 mm broad, spatulate, obtuse, entire, hyaline at base, thickened at apex, with fanlike-spreading veins, sparsely and minutely glandular-pubescent; flowers solitary, terminal, subsessile, small, bright yellow, heterostylous; bracts 1-2, narrowly lanceolate, 2 mm long and 0.3 mm broad, acuminate, adhering to calyx; calyx campanulate, parted 2/3 of the length, 2.5-4 mm long, finely glandular-pubescent, the sepals broadly lanceolate or lanceolate acuminate entire; corolla 12-17 mm long, glabrous, the tube 9-14 mm long, 3 1/2-4 times as long as the calyx, the limb 5-6 mm across, the rounded-ovate entire lobes 3 mm long; anthers ovaloid, 1 mm long and 0.3 mm broad; ovules 4-6; capsule ovoid, 2-3 mm long; seeds 1-3, very small, 1.2-1.5 mm long, 0.75-1 mm broad, ovoid, dark brown. April-June (Plate XII, Figure 2).

In crevices of precipitous rocks, at an altitude of about 1000 m. Soviet Central Asia: Mtn. Turkm. (Kopet Dag). **Gen. distr.:** Iran, Afghanistan. Described from Iran. Type in Leningrad.

2. *D. Kossinskyi* Czernjak. in Izv. Gl. Bot. Sada, XXVI, 2 (1927) 116; XXIX (1930) 148.

A compactly pulvinate subshrub, with short slender columnar branches; leaves 2-2.5 mm long and 1-1.5 mm broad, ovate or obovate, obtuse, entire, hyaline at base, thickened at apex, with fanlike-spreading veins, sparsely glandular-puberulent; flowers solitary, terminal, subsessile, on pedicels 0.5-1 mm long, small, brownish-violet; bracts 2, tightly adhering to calyx, lanceolate, acuminate, entire, 2-3.5 mm long and 0.5-1 mm broad; calyx cupuliform, parted to half the length, 2.5-3.5 mm long,

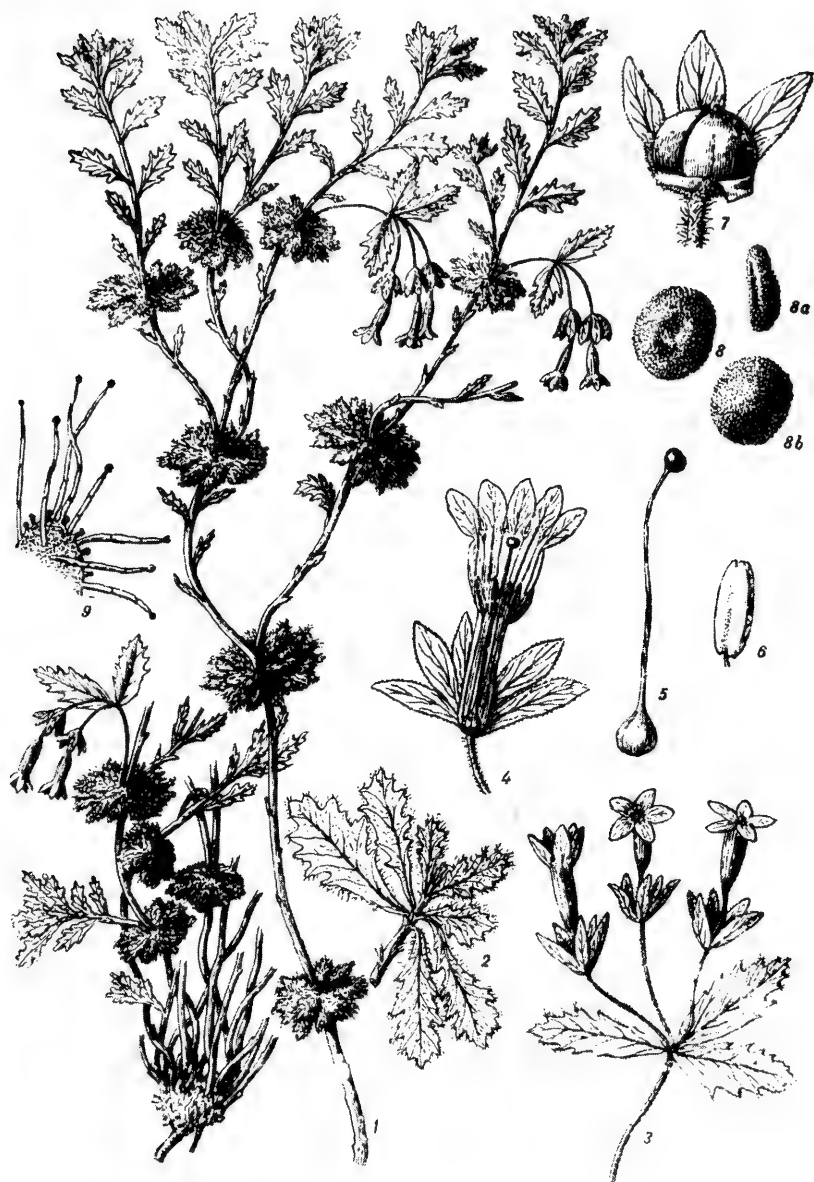


Plate XI

Dionysia hissarica Lipsky: 1) general view. 2) leaf rosette. 3) inflorescence. 4) flower in section. 5) pistil. 6) stamen. 7) capsule. 8) seeds in ventral view, 8a) seed in side view, 8b) seed in dorsal view. 9) leaf vestiture.

glandular-puberulent; sepals lanceolate to linear-lanceolate, acute, entire; corolla 12-13 mm long, glabrous, the tube 9-11 mm long, 3-3 1/2 times as long as the calyx, the limb 3-4 mm across, the obovate entire lobes 2-2.5 mm long; anthers oblong-ovaloid, 1 mm long; ovules 4-6; capsule subglobose, 1.5-1.8 mm long and 1.3-1.7 mm broad; seeds 2-4, very small, 0.75 mm long and 0.5-0.75 mm broad, broadly ovaloid or ovoid, dark brown. April-June (Plate XII, Figure 1).

Precipitous rocks in the high-mountain region. — Soviet Central Asia: Mtn. Turkm. **Gen. distr.:** Iran. Described from Iran (Khurasan, above the village of Khorkei, on Mt. Kyzul-Khysht). Type in Leningrad.

213 **Note.** This species differs from *D. tapetodes* Bge. in the smaller (12-13 mm) slightly pubescent violet flowers and the smaller leaves. The flowers of *D. tapetodes* are longer (up to 17 mm long), bright yellow, glabrous; and the leaves larger (up to 4 mm long).

Section 2. **DIONYSIOPSIS** (Pax) Smoljan. in Addenda XVII, 728. — Gen. *Primulae* sect. *Dionysiopsis* Pax in Schles. Gesellsch. für vaterländ. Kult. 87 Jahresber. II Abt. (1909) 19. — Flowers pedicellate, yellow, in umbels of 2-3 borne on nodding peduncles; bracts 2-3, resembling the leaves in shape and size, each margin 3-5-toothed; corolla tube twice the length of calyx, the lobes ligulate entire; ovules 20-30; seeds small, subglobose or broadly ovoid; leaves oblong-spatulate, thin, cuneately narrowed at base, with 4-5 teeth on either side, faintly aromatic, rosulate, on the internodes distant and alternate.

3. ***D. hissarica*** Lipsky in Tr. Bot. Sada, XVIII (1900) 83, Plate X. — *Primula hissarica* (Lipsky) Bornm. in Bull. Herb. Boiss. 2 ser. III (1903) 592.

Compactly pulvinate subshrubs; stems numerous, up to 30-40 cm long, very frail, initially pale yellow and lustrous, in age castaneous, with alternate leaves and a rosette of leaves at apex, most of the cauline and rosulate leaves dying off the following year and 2-3 new stems arising from each rosette, the stems eventually bearing a series of rosettes divided by internodes; leaves thin, spatulate-oblong, cuneately narrowed at base, sessile, tapering downward, with 3-4 or rarely 5 large teeth on either side, 6-16 mm long, 2.5-7 mm broad, faintly aromatic, strongly glandular-pubescent, the long hairs more numerous at the tips of teeth; peduncles slender, 10-23 mm long, nodding, glandular-pubescent; flowers yellow, in umbels of 2 or 3, pedicellate; pedicels 5-17 mm long, 1 mm thick, densely glandular-pubescent; bracts at the base of umbel 2-3, with 3-5 teeth on either side, 11-20 mm long and 5-10.5 mm broad, glandular-pubescent, resembling the leaves in shape and size; calyx 6-8.5 mm long, broadly campanulate, parted nearly down to base, glandular-pubescent; sepals acuminate, entire; corolla tubular-funnelform, 17-19.5 mm long, bare and the corolla tube cylindric, 13-15 mm long, twice the length of calyx, the limb 7.5-9 mm across, the lobes ligulate, entire, 4-4.5 mm long and 2 mm broad; anthers oblong-oval, 214 1.5 mm long and 0.5 mm broad; ovules 20-30; capsule subglobose, 4-5 mm long, 4-9-seeded; seeds small, 1.5-1.7 mm long and 1-1.5 mm broad, subglobose or broadly ovoid, flattened, brown, papillose. May-June (Plate XI, Figures 1-9).

Sandstone rocks, on northern slopes. — Soviet Central Asia: Pam.-Al. Endemic. Described from Gissar Range (Denau, Khursan R. gorge). Type in Leningrad.

Note. Pax (1909) included *D. hissarica* Lipsky as well as the W. Iranian species *D. Bornmülleri* in the section *Dionysiopsis* of the genus *Primula* which he established and regarded as closely related to the section *Floribundae* Pax. Bornmüller (Beih. z. Bot. Centralbl. Abt. II, XXVIII (1911) points out that the section *Dionysiopsis* Pax, occupying an intermediate position between the genera *Dionysia* and *Primula*, may be rightly considered as a distinct genus.

The study of *D. hissarica* Lipsky provides justification for regarding this species as representative of a separate section of the genus *Dionysia*. The systematics of *D. Bornmülleri* Strauss is as yet insufficiently clarified and its generic position needs further study.

Section 3. **DIONYSIASTRUM** Smoljan. sect. in Addenda XVII, 728.— Flowers subsessile, pale lilac, in umbels of 2-5 borne on erect peduncles; bracts 2-5, exceeding the leaves, with large unequal teeth, forming an involucre, corolla tube 3-3 1/2 times the length of calyx, the lobes obovate emarginate; ovules 6-16, ovaloid or oblong-ovaloid or ovoid, small, 1.75-2 mm long; leaves firm, broadly spatulate or obovate, with 3-5 small crenations at apex, aromatic.

4. ***D. involucrata*** Zapr. in Tr. Tadz. bazy, botanika, II (1936) 157, Figure 3.

A compactly caespitose subshrub, with dark brown rugose bark; branches densely covered with alternate leaves; leaves firm, small, 4-12 mm long and 2.5-6 mm broad, broadly spatulate or obovate, with 3-5 small crenulations at apex, pinnately veined, densely glandular-puberulent, the upper ones sometimes spatulate, short-acuminate, narrowed at base, almost entire; peduncles terminal, erect, 12-30 mm long, glandular-pubescent; flowers 3-5 in umbel, subsessile (pedicels 1-2 mm long), pale violet; bracts 3-5, forming an involucre, exceeding the leaves, 8-16 mm long and 5.5-17 mm broad, suborbicular, deeply cut into large unequal teeth, densely glandular-pubescent; calyx campanulate, parted 3/4 of the length, 7-9 mm long, densely glandular-pubescent; sepals lanceolate, short-acuminate, entire; corolla 24-35 mm across, the tube 20-29 mm long, 3-3 1/2 times the length of calyx, glandular-puberulent, sparsely so in upper part; corolla limb 7-14 mm, the lobes 4-6 mm long and 3.5-4 mm broad, obovate, emarginate, glabrous; ovules 6-16; anthers oblong-oval, 2 mm long, 0.5 mm broad; capsule ovoid, 2.5 mm long and 2 mm broad, 5-16-seeded; seeds ovaloid or oblong-ovaloid or ovoid, dark brown, small, 1.75-2 mm long and 1-1.5 mm broad, the surface papillose. May-July (Plate XII, Figure 3).

Rocks on northern and northwestern slopes, at altitudes above 1000 m.— Soviet Central Asia: Pam. Al. (Gissar Range). Endemic. Described from the Gissar Range from Kandara R. Gorge. Type in Leningrad.



Plate XII

1. *Dionysia Kossinskyi* Czernjak. 2. *D. tapetodes* Bge. 3. *D. involocrata* Zapr. Drawings of plant details annotated by letters: a) general view, b) flower in section, c) stamen, d) calyx, e) bract, f) capsule, g, i, k) seed in dorsal, lateral, and ventral view, l, m), branchlet, n) leaf vesture.

Calyx parted from lower one third or from the middle, very rarely from base, campanulate or subspherical; corolla salverform or funnellform, the tube equaling the calyx, the throat constricted; stamens included in the corolla tube, the filaments very short, the anthers obtuse; style not exceeding the corolla tube; capsule globose, opening from top toward base by 5 lobes or rarely 6-8 by splitting of the main valves; seeds variable in size, mostly few, rarely numerous. Annual, biennial, or perennial herbs, with ascending or decumbent shoots forming loose or compact cushionlike mats. Leaves mostly gathered in a subradical rosette; flowers mostly in a scapose umbel or solitary, with bracts at the base of pedicels.

About 100 species, distributed chiefly through Eurasia, and most
218 abundant in the mountains of Soviet Central Asia, China and eastern Asia in general, in the Caucasus and in the Alps; also occurring in North America and sporadically in Tierra del Fuego.

1. Perennials, often rather compactly cespitose 2.
- + Annuals or biennals 20.
2. Leaf rosettes grayish with soft white hairs covering the leaves especially at the tips 3.
- + Leaf rosettes greenish; leaf blades commonly glabrous, merely ciliate at the margin, rarely covered with glandular hairs 12.
3. Inflorescence 1-2 (3)-flowered 4.
- + Inflorescence 3-10-flowered 6.
4. Cushions compact; leaves navicular, 2-4 mm long, 0.8-1 mm broad. . 5.
- + Plants loosely cespitose; leaves straight, oblong-linear, 4-6 mm long, 1 mm broad. 10. **A. angrenica** Ovcz.
5. Leaves hairy over nearly the whole surface (Altai, Sayans, Dzungarian Ala Tau) 8. **A. dasyphylla** Bge.
- + Leaves hairy merely in upper part (E. Pamir, Alai) 9. **A. acrolasia** Ovcz. et Vved.
6. Pedicels long, several times the length of the bracts; the entire inflorescence caducous in fruit (Pam.-Al.) 3. **A. caduca** Ovcz.
- + Pedicels short, equaling or slightly exceeding the bracts, and if much longer than the inflorescence not caducous in fruit 7.
7. Leaves linear, 8-15 mm long, 1-1.5 mm broad. 8.
- + Leaves lanceolate or obovate, 3-8 mm long, 1.8 mm broad. 10.
8. Leaves silvery-sericeous by dense pubescence; pedicels 2-3 times the length of bracts (mountains of S. Siberia) 5. **A. incana** Lam.
- + Leaves not densely sericeous; pedicels short, barely exceeding the bracts (European part of the USSR) 9.
9. Leaves acutish (Crimea) 6. **A. taurica** Ovcz.
- + Leaves obtusish (V.-Don, L. Don). 7. **A. Koso-Poljanskii** Ovcz.
10. Plants slightly pubescent, green, loosely cespitose (Altai, Tarbagatai). 2. **A. Ovczinnikovii** Schischk. et Bobr.
- + Leaves grayish by dense pubescence; plants compactly cespitose . . 11.

* Name mentioned by Dioscorides; from Greek, andro = man, and sake = shield.

** Arranged by B. K. Shishkin and E. G. Bobrov, utilizing the unfinished manuscript of P. N. Obchinnikov.

11. Leaves 6-8 mm long (Caucasus) 4. *A. barbulata* Ovcz.
- 219 + Leaves 3-6 mm long (mountains of Soviet Central Asia) 1. *A. sericea* Ovcz.
12. Flowers in a 3-8-flowered umbel 13.
- + Flowers solitary, sessile or borne on very short pedicels. 18.
13. Leaf blades glabrous above and beneath, the margin ciliate 14.
- + Leaf blades merely ciliate on the margin, very rarely with few hairs on the blade surface 15.
14. Scapes 1-4 cm long; leaves covered with rusty glandular hairs (northern part of the Far East) 11. *A. capitata* Willd.
- + Scapes 2-6 cm long; leaves covered especially beneath with short white hairs (high mountains of Soviet Central Asia) 12. *A. akbaitalensis* Derg.
15. Plants 3-7 cm tall; inflorescence compact; pedicels equaling the bracts (Caucasus) 15. *A. Lehmanniana* Spreng.
- + Plants 5-15 cm tall; inflorescence comparatively loose; pedicels longer or greatly exceeding the bracts. 15.
16. Inflorescence 1-3 (4)-flowered; leaf blades linear-lanceolate, 10-15 mm long, 2-3 mm broad, often arched reflexed; mats compact (Nov. Z., Arc. Sib.) 16. *A. triflora* Adams.
- + Inflorescence 4-8 (10)-flowered (mountains of Siberia and Soviet Central Asia). 17.
17. Leaf blades obovate, 4-10 mm long and 2-5 mm broad; mats loose (mountains of Siberia). 14. *A. Bungeana* Schischk. et Bobr.
- + Leaf blades lanceolate to linear-lanceolate, 4-10 mm long and 1-3 mm broad (Soviet Central Asia) 13. *A. Olgae* Ovcz.
18. Flowers sessile; calyx parted nearly from base; leaves 1.5-2 mm long, tightly appressed to each other, glandular, ciliate-margined (Pamir). 19. *A. bryomorpha* Lipsky.
- + Flowers borne on pedicels up to 5 mm long; calyx parted barely to the middle; leaves 4-10 mm long, hairy 19.
19. Leaves 9-10 mm long, elongate-linear, obtusish, covered with scattered hairs; plants loosely pulvinate . . . 17. *A. ochotensis* Willd.
- + Leaves 4-5 mm long, oblong, densely covered with branches and forming hairs and ciliate on the margin; plants compactly pulvinate. 18. *A. arctica* Cham. et Schlecht.
20. Calyx teeth longer than the tube; calyx strongly accrescent in fruit; bracts large 33. *A. Turczaninovii* Freyn.
- 220 + Calyx teeth shorter than or equaling the tube; calyx not strongly accrescent in fruit; bracts small 21.
21. Pedicels shorter than to about equaling the bracts 22.
- + Pedicels twice to many times as long as the bracts 23.
22. Flowers numerous in compact heads; bracts acute 22. *A. albana* Stev.
- + Flowers few; bracts obtuse (mountains of Adzharistan). 23. *A. bidentata* C. Koch.
23. Pedicels 2-4 times as long as the bracts 24.
- + Pedicels many times as long as the bracts 27.
24. Calyx glabrous. 25.
- + Calyx hairy or glandular 26.
25. Plants glabrous or merely the leaf margin ciliate (W. Transcaucasia). 26. *A. intermedia* Ldb.

- + Plants pubescent; leaf margin glabrate 27. *A. Raddeana* Somn. et Lév.
- 26. Calyx covered with conspicuous large red glands; corolla very large, white, more than 6 mm across 25. *A. macrantha* Boiss. et Huet.
- + Calyx hairy, with scarcely discernible reddish glands; corolla 5-6 mm across, white or rosy ; 24. *A. armeniaca* Duby.
- 27. Leaves petiolate, the petiole 3-4 times the length of the blade, this elliptic or oblong-ovate or reniform or orbicular 28.
- + Leaves sessile or nearly so, lanceolate or oblong 30.
- 28. Leaves reniform or orbicular 29.
- + Leaves elliptic or oblong-ovate, the petiole about as long as the blade; bracts numerous, linear-lanceolate 32. *A. filiformis* Retz.
- 29. Leaves reniform, sinuate at base 21. *A. Gmelini* (Gaertn.) Roem. et Schult.
- + Leaves orbicular, not cordate-sinuate at base 20. *A. umbellata* (Lour.) Merr.
- 30. Corolla equaling or very slightly exceeding the calyx 31.
- + Corolla about twice the length of the calyx 32.
- 31. Pedicels one-third to half as long as the scape 28. *A. elongata* L.
- + Pedicels as long as the scape 31. *A. septentrionalis* L.
- 32. Scares shorter than the pedicels or obsolescent 30. *A. Fedtschenkoi* Ovcz.
- 221 + Scares several times as long as the pedicels 29. *A. lactiflora* Pall.

Section 1. **CHAMAEJASME** C. Koch in Synops. Fl. Germ. (1837) 584; Ldb. Fl. Ross. III, 16; Knuth in Engl. Pflanzenr. IV, 237, 180.—Rather compactly caespitose perennials; leaves ovate, elliptic, or linear, sessile.

Subsection 1. **VILLOSAE** Hand.-Mzt. in Notes R. Bot. Gard. Edinb. XV (1925-1927) 278, pro serie.—Leaf rosettes cinerescent by white hairs covering the leaf surface and the tips, lanceolate, oblong-lanceolate, or linear; inflorescence 3-10-flowered.

1. *A. sericea* Ovcz. in Addenda XVII, 728.—*A. villosa* auct. fl. Asiae Mediae, ex p.

Perennial, loosely caespitose, sprawling, rarely compactly pulvinate-caespitose, grayish-white; leaves of fertile rosettes of more or less equal length, linear-lanceolate, acuminate, narrowed toward base, 3-6 mm long, 0.8-1.4 mm broad, in a loose rosette, covered nearly down to base on the margin and on both sides, though more densely beneath, with long thin silky hairs, but sometimes nearly glabrous above; leaves of sterile shoots few, short; scapes solitary, 4-5 cm long, slender, pale green, often curved, covered with spreading somewhat tangled hairs, 2-3 (4)-flowered; pedicels shorter to slightly longer than the bracts; bracts 5-7 mm long, broadly lanceolate or lance-elliptic, densely covered with long silky spreading hairs; pedicels varying in length; corolla 7-8 mm across, whitish-creamy, yellowish at the throat, the lobes round-tipped and often slightly crenulate; calyx sublanceolate with long hairs, parted nearly to the middle into lanceolate acutish teeth. June-July.

Stony and gravelly slopes in the steppe and juniper belt, especially in the subalpine zone.—Soviet Central Asia: T. Sh., Pam.-Al. Endemic. Described from W. Tien Shan. Type in Leningrad.

Note. Plants occurring in the Gorno-Zeravshan* basin are distinguished by the extremely loose and large mats and very long shoots.

2. **A. Ovczinnikovii** Schischk. et Bobr. in Addenda XVII, 729.—
A. villosa Bge. in Ldb. Fl. alt. I (1829) 217, non L. ex p.; Kryl. Fl. Alt. III, 814.

Perennial, silvery-green, loosely cespitose, (4) 5-6 (7) cm tall;
222 heterophyllous; leaves of fertile rosettes oblong-linear or linear-lanceolate, narrowed toward base, round-tipped or obtusish, covered on the margin with long slightly articulate slender spreading hairs interspersed on the outside and along the entire margin with minute capitate subsessile hairs, sometimes glabrous on the upper surface, the outer leaves 3-6 mm long, the inner ones 7-12 mm long, all up to 1-1.8 (2.2) mm broad; leaves of the numerous sterile shoots lanceolate or somewhat broader, 4-7 mm long, up to 2-2.5 mm broad, obtusish to subacute, pubescent on the margin and on the distal part of the lower surface; young shoots reddish, rather densely covered with long spreading hairs; scapes 3.5-4.5 cm long, slender, 3-7-flowered, covered with long spreading white hairs and numerous very soft capitate hairs; umbel rather compact; bracts 5-6, lance-elliptic, rather densely covered, especially above and on the margin with long white and short capitate hairs, 4-6 mm long and 2-2.3 mm broad, subsaccate-auriculate at base, much longer than the pedicels, pedicels up to 2 mm long, densely hairy; calyx 3-3.5 mm long, broadly campanulate, densely covered with silky hairs, cleft to the middle or lower down into oblong-lanceolate more or less rounded teeth, these slightly shorter than the corolla tube; corolla white, at length turning rose, up to 8-9 mm across, the lobes broadly rounded-obovate, entire or slightly emarginate. May-June.

Steppe rocks and stony slopes or humidsaline meadows.—W. Siberia: Irt. (SW), Alt.; Soviet Central Asia: Dzu.-Tarb. **Gen. distr.:** Mong. (W. mountainous part). Described from the Charysh River (Altai). Type in Leningrad.

3. **A. caduca** Ovcz. in Bot. Mag. Gerb. Bot. inst. AN SSSR, VII, 1 (1937) 21-22.

Perennial, pulvinate, up to 6 cm tall, with numerous remnants of old leaves; rosettes densely hairy; leaves 6-8 mm long, linear-lanceolate, acutish, covered on both sides with soft hairs, more so on the lower surface; scapes 6-8 mm long or almost undeveloped, very densely covered with spreading hairs, many-flowered; bracts 6-8 mm long, sublinear-lanceolate, acute, hairy; pedicels 10-16 mm long, slender, covered with spreading hairs; inflorescence fully caducous in fruit; calyx cleft to 1/4-1/3 the length into narrowly lance-oblong hairy teeth; corolla tube barely exceeding the calyx teeth, the constricted throat with a purple rim; corolla lobes oblong-
225 obovate, emarginate, with scattered long hairs at base; anthers sessile; seeds few, up to 2 mm long, faintly scabridulous, dark brown, tuberculate at the top. July.

Among sparse tragacanth and wormwood-and-grass vegetation and on stony slopes of the high-mountain region, at altitudes of 2300-3500 m.—Soviet Central Asia: Pam.-Al. Described from the Yagnob R. basin. Type in Leningrad.

* [Also known as Matcha River, the mountainous part of the Zeravshan River.]

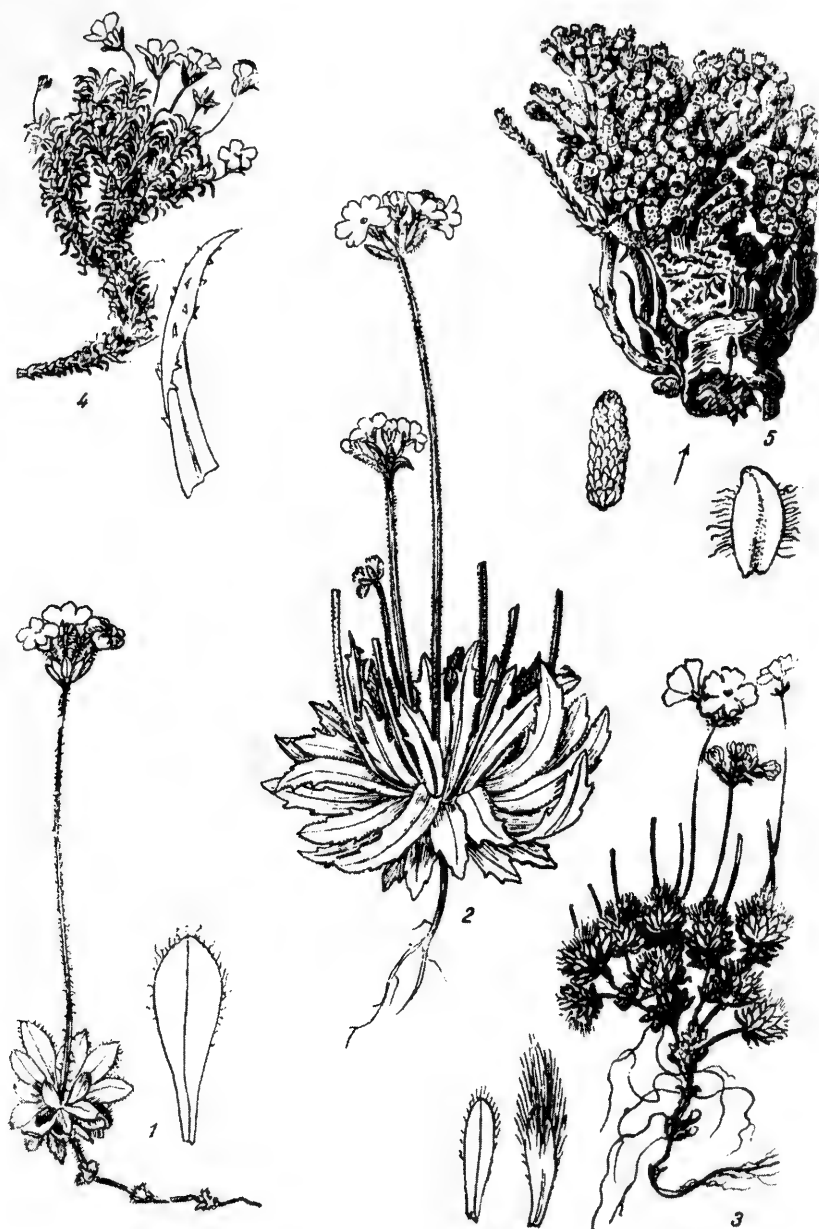


Plate XIII

1. *Androsace Bungeana* Schischk, et Bobr. 2. *A. albana* Ster. 3. *A. incana* Lam.
4. *A. ochotensis* Willd. 5. *A. bryomorpha* Lipsky, a column-densely leafy shoot (in 3-fold enlargement) and a leaf.

4. *A. barbulata* Ovcz. in Addenda XVII, 729.—*A. villosa* auct. fl. cauc.; Kuzn. in Mat. Fl. Kavk. IV (1901) 121; Grossg. Fl. Kavk. III, 209.—Exs.: Fl. cauc. exs. No. 123; GRF, No. 427.

Perennial, loosely caespitose, sericeous and cineraceous-arachnoid, rarely glabrate (var. *glabrata* Trautv.); leaves of fertile rosettes lanceolate, 6-7 mm long, 0.5-1 mm broad, narrowed toward base, the outer ones relatively shorter, densely covered on both sides, though more so beneath, with long hairs; leaves of sterile rosettes linear-oblong to lanceolate; scapes short or up to 3-6 mm long, (2) 3-5-flowered, densely floccose with long flexuous hairs; bracts ovate-lanceolate, densely pilose, sometimes sublanuginous, longer or rarely shorter than the pedicels; calyx very densely lanuginous-pilose, cleft to about the middle or somewhat less deeply into oblong-lanceolate densely pilose teeth; flowers 3-6 mm large, 8-11 mm across, creamy-white or rosy-purple; petals obovate, uneven and sometimes subtruncate at apex. May-June.

Subalpine and alpine slopes, rocks, and taluses, at altitudes of 1400-3000 m.—Caucasus: Cisc., W., S., and E. Transc. Endemic. Described from the Kabardian ASSR. Type in Leningrad.

Note. A somewhat variable species; it is possible to distinguish a distinct less hairy variety, with long pedicels and scapes.

5. *A. incana* Lam. Illustr. tabl. encycl. I (1791) 432.—*A. villosa* Turcz. var. Fl. baic.-dahur. II, 1 (1856) 230-231, non L.; Kryl. Fl. Zap. Sib. IX, 2136, non L.—*A. villosa* var. *Turczaninovii* Freyn in Oesterr. Bot. Zeitschr. XLVII (1896) 53.—*A. villosa* var. *incana* Duby in DC. Prodr. VIII (1844) 50; Knuth in Engl. Pflanzenr. IV, 237, 192.—Ic.: Lam. l. c.

Perennial, canescent or cineraceous with white hairs, loosely caespitose; caudices stoutish, elongated, sprawling, dark brown to nearly black, dull; leaf rosettes commonly distant, except for the rather crowded young ones, semi-oval, mostly densely silvery-canescant, the marcescent leaves of the
226 preceding year remaining in rosettes, grayish-brown, with a prominent vein up to 0.7 cm long on the lower side, covered with scattered hairs, appressed to the young leaves; leaves up to 0.5-1 cm long and 1.3 mm broad, lanceolate, covered outside especially in distal part and to a lesser extent inside with scattered long grayish-white hairs, these forming a tuft at apex, the margins covered with long hairs; scapes 3-5 (8) cm long or obsolescent, 1 or 2 per rosette, covered with long tangled spreading nodding hairs; umbel 2-3 (5)-flowered; bracts lanceolate, rather densely sericeous with subappressed hairs, up to 4-6 mm long; pedicels commonly 1/2-3 (4) times the length of bracts, up to 0.6-0.8 (1) cm long, covered with spreading flexuous hairs; calyx broadly short-campanulate, parted to 1/3 or less, canescent, the teeth shorter than the corolla tube, their margin beset with long spreading hairs; corolla white or yellowish-white, with a purple rim at the throat, 0.8-1 (1.2) cm across; petals rounded-obovate, somewhat wavy at the margin, unequal; seeds angular-ovoid or ellipsoid, obscurely angled, alveolate. May-June (Plate XIII, Figure 3).

Dry gravelly and stony steppes, in stony sandy soil, on crags, and in rock crevices.—W. Siberia: Alt. (Akboon on the Chu R.); E. Siberia: Ang.-Say; Dau., Lena-Kol.; Far East: Ze.-Bu. Gen. distr.: Mongolia. Described from E. Siberia. Type in Paris.

6. **A. taurica** Ovcz. in Addenda XVII, 730. — *A. villosa* auct. et collect. fl. taur. — Exs.: GRF, No. 427.

Perennial, sericeous-green throughout, diffusely cespitose; leaves in flat rosettes; outer leaves 3-4 mm long, lanceolate to oblong-lanceolate, acutish, covered beneath with scattered hairs, these at apex and on the margin mostly minute and capitate; inner leaves up to 9-12 mm long, linear-lugulate, gradually narrowed toward base, acuminate at apex, on the margin and at apex silky-pilose; outer leaves of sterile rosettes linear-lanceolate to linear, acuminate, 7-14 mm long, 0.5-1.4 mm broad, appressed-pilose over the entire lower surface, with a tuft of hairs at apex; shoots of the current year reddish, covered with scattered appressed hairs, up to 2.5-3 cm long; scapes 5-8 cm long, covered with long spreading and drooping hairs bearing 2-4 flowers; bracts lance-elliptic, acutish, covered with appressed hairs, 5-6 mm long and 1.5 (2) mm broad, shorter than the pedicels; pedicels 8-10 mm long, covered with appressed hairs; calyx parted to the middle or partly lower down, appressed-pilose, the teeth lanceolate; corolla limb up to 7 mm across, rather prominently ridged at throat. May-June.

27 Sparse beech woods; open and rocky steppe-like slopes. — European part: Crimea. Endemic. Described from the Crimea. Type in Leningrad.

7. **A. Koso-Poljanskii** Ovcz. in Addenda XVII, 731. — *A. villosa* auct. et collect. Fl. Ross.

Perennial, very closely related to the preceding species, also forming large loose tufts with numerous rosettes and scapes; differing from the Crimean plants in the more compact many-leaved rosettes, the obtusish leaves less hairy and somewhat rigid with a prominent midrib beneath; scapes sublanuginous with long whitish, almost drooping hairs (as opposed to the spreading lustrous white hairs of *A. taurica*); outer leaves 5-6 mm long, up to 2 mm broad, suboblong-lanceolate, the inner ones 14-17 mm long and 2 mm broad, linear, strongly narrowed toward base, all covered on the margin beneath and at apex with long silky white hairs, these interspersed on the margin with soft capitate hairs; scapes bearing (1) 2-3-7-flowers. from 3-4 to 8-9 cm long. May-June.

Chalky and steppe slopes. — European part: V.-Don. L. Don. Endemic. Described from Voronezh Region. Type in Leningrad.

Subsection 2. **DASYPHYLLAE** Ovcz. — Very compactly, often pulvinately cespitose plants; leaves covered with rather long silky-white or silvery-white hairs, acutish, those of the preceding year usually persistent at rosette base; scapes abbreviated or obsolescent, bearing 1-3 flowers.

8. **A. dasyphylla** Bge. in Ldb. Fl. alt. I (1829) 218; Ldb. Fl. Ross. III, 16; Kryl. Zap. Sib. IX, 2137. — *A. altaica* C. Koch in Linnaea, XXIII (1950) 612. — *A. villosa* var. *dasyphylla* Knuth in Engl. Pflanzenr. IV (1901) 192-193, ex p. — Ic.: Ldb. Ic. pl. Fl. Ross. alt. ill. tab. 15.

Perennial, canescent, covered with long white hairs (the hairs dimorphous: some long, multicellular, weak; others very short, barely discernible, capitate), compactly pulvinate, with short prostrate strongly branched caudices; young shoots strict, short, reddish-brown, hairy or glabrate; rosettes approximate, compact, subspherical or ovaloid, 3-5 mm in diameter; leaves imbricated, subequal, 2.5-4 mm long, ca. 0.8-1 mm

broad, lanceolate to linear-oblong, cuneate at base, acutish to obtusish, narrowed toward base, glabrous above, covered beneath especially at apex
228 with long hairs, finally becoming glabrate, the outer ones navicular, appressed to the more densely hairy inner leaves; leaves of the preceding year appressed upward, persistent, glabrous or with few hairs at apex; scapes 0.4-1.2 cm long or obsolete, covered with long spreading hairs; bracts 2-3, lance-linear to linear, acute, 2-4 mm long and 0.6-1 mm broad, equaling or exceeding the calyx, covered with long spreading hairs; flowers solitary or in pairs; calyx campanulate, 3-3.5 mm long, rather densely covered with appressed hairs, 5-parted to 1/3 the length or to the middle, the obtuse ovate teeth densely hairy on the margin; corolla white or rose, 5-7 mm across, the limb rounded-obovate, 2.8-3 mm long, 2.6-2.8 mm broad, narrowed toward base, entire, slightly ridged around the throat. May-June.

Rocks, and stony and gravelly slopes. — W. Siberia: Alt.; E. Siberia: Ang.-Say.; Soviet Central Asia: Dzu.-Tarb. (Dzungarian Ala Tau).

Gen. distr.: Mong. Described from the Altai (rocks along the Charysh, Kan, Kerlyk and Chu rivers, according to Bunge's collections). Type in Leningrad.

9. **A. acrolasia** Ovcz. et Vved. in Bot. Mat. Gerb. Bot. inst. AN SSSR, 1-3 (1941) 213, illustr.

Perennial, silvery-white throughout, compactly pulvinate; shoots toward apex covered throughout with imbricated leaves forming together with sterile shoots a compact column; leaves all alike, 2-2.5 (3) mm long, short-lanceolate, mostly navicular, thickish, bounded by a thickened margin, glabrous in lower part, obscurely and sparsely covered on the margin with very short capitate hairs, the upper one-third of the blade furnished with a dense tuft of long upright silky silvery-white hairs, these persistent even on dead leaves; scapes obsolescent with a subsessile umbel or 4-8 mm long, covered with more or less spreading tangled long hairs, bearing 1-3 flowers; bracts about equaling the calyx, lanceolate, densely hairy, marginate, conduplicate; calyx covered with appressed hairs, the teeth oblong; flowers borne on very short pedicels, pale yellow; corolla lobes obovate-oblong, denticulate at apex; seeds up to 2.2 mm long, trigonous, oblong, dark brown with whitish-gray alveolation. July-August.

Stony and gravelly places and taluses, rarely gravelly steppes, in the high-mountain region, at altitudes of 3000-4500 m. — Soviet Central Asia: Pam.-Al. (E. part only). Endemic. Described from Kzyl-Art Pass in the Trans-Alai Range. Type in Leningrad.

10. **A. angrenica** Ovcz. in Addenda XVII, 731.

Perennial, grayish-green, slightly pubescent, at length glabrate, rather loosely caespitose, the numerous creeping stolons bifurcate or with 3-6
229 branches from a node, each branch with a cluster of leaves; young stolons numerous, slender, glabrous or nearly so, weak, light purple, terminating in a small rosette; leaves all small, grayish-green, thickish, spatulate-lanceolate, narrowed toward base, with a prominent vein beneath, glabrous above, covered beneath with short bristlelike hairs becoming glabrous, gathered in small compact oval rosettes; scapes 10-15 mm long or obsolescent, covered with long flexuous spreading brittle hairs; bracts lanceolate, exceeding the pedicels, pilose; umbel 1-2-3-flowered; calyx

cleft down to lower third or at least below the middle into long narrowly lanceolate obtusish appressed-hairy teeth; petals narrow, oblong-lanceolate, often emarginate or denticulate at apex.

Near hot springs, at altitudes of 2700-3000 m. — Soviet Central Asia: Tien Shan (W.). Endemic. Described from Arasan. Type in Leningrad.

Subsection 3. CHAMAEJASMOIDEAE Hand. -Mzt. in Notes R. Bot. Gard. Edinb. XV (1925-1927) 281, pro subserie. — Leaf rosettes green; leaves merely ciliate on the margin, the blade glabrous above or nearly so, sparsely hairy beneath, oblong-obovate.

11. **A. capitata** Willd. ex Roem. et Schult. Syst. IV (1819) 786. — *A. chamaejasme* Mertens, Bemerk. Fl. Koragin (1830) 64; Knuch in Engl. Pflanzenr. IV, 237, 190 (var. ♂ *capitata*); Kom. Fl. Kamch. III, 26, ex p. — *A. Lehmanniana* Hult. Fl. Kamtch. IV (1930) 53, ex p. non Spreng.

Perennial, diffusely caespitose; stolons obtusish, reddish-brown, glabrous or in upper part with scattered or isolated appressed dull hairs, 2-3-branched from the nodes; leaves obovate or subelliptic, narrowed toward base, obtuse, the inner ones often oblong-lanceolate to oblong-elliptic, 6-10 mm long, 3-4.4 mm broad, the margin — except at base, and especially in upper part — having on both sides suberect unequal long 4-7-celled flattened rather rigidly and weakly articulate hairs projecting beyond the leaf apex; scapes (1) 3-5.5 cm long, erect or slightly curved, densely covered with tangled flexuous white or brownish-white hairs; bracts up to 2.5-4 mm long and up to 0.8-1.8 mm broad, oblong-lanceolate or lance-elliptic, rarely elliptic, rather densely covered at the margin on both sides with long white hairs and on the outer surfaces with rather numerous short
230 capitata hairs, obtuse or round-tipped, equaling or exceeding or rarely slightly shorter than the pedicels; umbel 3-4 (6)-flowered; flowers often subsessile; calyx parted to the middle or lower down, the teeth oblong-lanceolate, attenuate toward apex but obtuse, densely covered with long sprawling white hairs; corolla limb 7-8 mm across, the lobes obovate entire, the throat framed by a low tuberculate ridge. August.

Mainly in mossy and gravelly tundra. — Arctic: Chuk., An.; Far East: Kamch., Okh., Uda (Ayan). **Gen. distr.:** Ber. Described from Kurile Islands. Type in Berlin.

12. **A. akbaitalensis** Derg. in Tr. Bot. Sada, XXI (1903) 375; Fedch. O. and B. Perech. rast. Turk. 5, 8. — *A. chamaejasme* var. *hirtifolia* Rupr. Sert. Tiansch. (1869) 60.

Perennial, forming small mats, with numerous persistent old leaves, pale green; outer rosette leaves shorter than the inner ones, obovate, obtuse, the inner ones 15-18 mm long, oblanceolate, gradually narrowed toward base, acutish at apex, all glabrous except for the stiffly ciliate margin, with scattered bristles in terminal part beneath; scapes 2-6 cm long, covered with scattered subappressed or somewhat spreading hairs or glabrate; umbel 6-10-flowered; bracts oblong-lanceolate, the margin and apex pilose; pedicels slightly shorter than or about equaling the pedicels; calyx faintly pubescent, parted to above the middle into bluntly round-tipped teeth; corolla white or rosy-purple, 7-8 mm across; petals obovate. July-August.

Slopes in the alpine and subalpine zones, on stony taluses or moraines.—
Soviet Central Asia: T. Sh., Pam.-Al. **Gen. distr.:** Dzu.-Kashg.
Described from Pamir. Type in Leningrad.

13. **A. Olgae** Ovcz. in Bot. Mat. Gerb. Glavn. Bot. Sada, III, 26 (1922)
103.—*A. chamaejasme* f. *angustifolia* Rgl. et Fedtsch. in Fedch.
O. and B. Perech. rast. Turk. 5 (1913) 7.—*A. aflatunensis* Ovcz. in
Izv. Glavn. Bot. Sada, XXVII (1928) 551.—*A. darvasica* Ovcz. l.c.
552.—*A. angustifolia* B. Fedtch. l.c. ex p.—Exs.: HFAM, No. 151.

Perennial, pale green, forming large loose mats, mostly with long
prostrate stolons bearing numerous rosettes; stolons of the current year
(sterile) shorter than to about equaling the scapes, reddish, sparsely
covered with subappressed hairs; leaves variable, elongate-lanceolate,
the outer leaves of the rosette 4-6 mm long, up to 3 mm broad, subovate-
lanceolate, early marcescent, scarcely narrowed toward base, the much
231 longer inner leaves 10-18 mm long, 1-2 mm broad, narrowly lanceolate,
gradually narrowed to a subpetiolar base, acutish to subobtuse, thin,
glabrous, the margin having sparse short capitate hairs and longer,
more or less spreading silky-white hairs, these more numerous toward
apex, covering the apical part of the blade and extending beyond apex as
a tuft of several hairs, or leaves finally becoming glabrate; leaves of
sterile shoots 9-12 (14) mm long, 2-2.5 (3) mm broad, lanceolate, unequal,
glabrate, sometimes with long hairs on the margin, rounded and somewhat
pointed at apex; scapes up to 3.5-8.5 cm long, covered with scattered,
drooping or almost downward-appressed hairs, finally glabrate; umbel
3-5 (8)-flowered; bracts ovate-lanceolate or ovate or oblong, 3-5 mm long,
long-pilose on the margin and at apex, somewhat sacculate at base; pedicels
5-8 mm long, pilose and covered with few short capitate hairs; calyx
campanulate, up to 3 mm long, densely lanuginous-pilose, parted to the
middle; calyx teeth oblong-ovate, obtuse, with a dense tuft of hairs; corolla
whitish or rosy, up to 6 mm across; corolla lobes oblong-obovate, truncate
or irregularly denticulate, or rarely emarginate at apex; the throat purple-
spotted. June-July.

Valleys of mountain streams and their banks, water meadows, up to
3200 m.—Soviet Central Asia: T. Sh., Pam.-Al. **Gen. distr.:** Dzu.-Kashg.
Described from Alai. Type in Leningrad.

14. **A. Bungeana** Schischk. et Bobr. nom n.—*A. Lehmanniana*
Hand.-Mztt. in Notes R. Bot. Gard. Edinb. XV (1925-1927) 281, ex p.
non Spreng.; Kryl. Fl. Zap. Sib. IX, 2137.—*A. villosa* var. *latifolia*
Bge. in Ldb. Fl. alt. I (1829) 218; Kar. et Kir. in Bull. Soc. Nat. Mosc.
XIV, 218.—*A. chamaejasme* Knuth in Engl. Pflanzenr. IV, 237 (1905)
188, ex p. non Host.

Perennial, forming large loose mats, pale green, the scapes elongating
after anthesis; stolons slender, branched, sprawling, reddish-brown,
sparsely covered with appressed hairs, terminating in fairly loose open
pale green leaf rosettes; leaves not tightly appressed to each other, more
or less divergent, the outer ones shorter and broader than the others,
oblong-obovate, soon marcescent and becoming light or dark brown, the
inner leaves oblong-lanceolate or lance-elliptic, 12-16 (20) mm long, up
to 4 mm broad, gradually tapering into a long and narrow base, short-
acuminate at apex and partly, especially the inner ones, rounded-obtuse,

all regularly long-ciliate on the margin, the hairs white-translucent, mostly 3-4 (7)-celled, articulate, interspersed with short 2-3-celled hairs; leaf
 232 blade pale green, with a rather prominent vein beneath, glabrous or with few scattered hairs beneath and with more or less scattered hairs above, the leaf apex sometimes furnished with denser erect hairs; scapes 6-12 cm long, erect or slightly flexuous, covered with scattered long articulate drooping or spreading whitish hairs; bracts green, ovate-lanceolate or oblong-ovate, mostly conduplicate, up to 4 mm long, acuminate, covered with scattered long upright whitish hairs, more densely so on the margin; pedicels as a rule 2-2 1/2 times as long as or equaling the bracts; umbel (3) 4-5 (6)-flowered; pedicels pilose; calyx more or less campanulate, parted to about the middle, covered with scattered silky hairs, subovate-elliptic, obtuse; corolla tube barely exceeding the calyx; corolla up to 6-9 mm across, the petals whitish or rose, oblong-obovate, the throat framed by a ridge. June-July (Plate XIII, Figure 1).

Rocks, stony screes, rarely mountainous moss-and-lichen tundra. — Arctic: Eur. Arc. (Bol'shezemel'skaya Tundra, Arctic Urals, Vaigach Is.), Arc. Sib. (W. part and Taimur); European part: V.-Kama (high mountains of the Central Urals); W. Siberia: Alt.; E. Siberia: all regions; Far East: Ze.-Bu.; Soviet Central Asia: Dzu.-Tarb.; T.Sh. (N.). **Gen. distr.:** Mong. (Sentelek, Khorgon). Type in Leningrad.

15. **A. Lehmanniana** Spreng. in Isis (1817) 1289, tab. 9. — *A. Chamaejasme* Ldb. Fl. Ross. III (1847) 18, p.p. non Host; Kuzn. in Mat. Fl. Kavk. VI, 1, 125; Grossg. Fl. Kavk. III, 209. — *A. longiscapa* Koch in Linnaea, XXIII (1850) 611.

Perennial, slightly hairy; the hairs articulate, not forming tuft at leaf apex; leaves up to 10 mm long, 2-3 mm broad, ovate-lanceolate to lanceolate, acute, narrowed toward base, flat, glabrate, with spreading bristlelike hairs on the margin; umbel few-flowered; bracts linear-spatulate, shorter than or equaling the pedicels; scapes up to 3-5 cm long, bearing 3-8 flowers; bracts shorter than or equaling the calyx, the teeth acute ciliate; corolla 6-8 mm across, white or rosy, the lobes obcordate. June.

Gravelly and stony places in the alpine zone. — Caucasus: Cisc., Dag., E. Transc. Described from the East. Type in Berlin.

16. **A. triflora**. Adams in Mem. Soc. Nat. Mosc. V (1817) 89. — *A. chamaejasme* var. *triflora* Knuth in Engl. Pflanzenr. IV, 237 (1905) 190. — *A. Friesii* Trautv. in Tr. Bot. Sada, IX (1884) 7. — *A. septentrionalis* var. *ciliata* Trautv. in Tr. Bot. Sada, I (1871) 74.

233 Perennial, glabrate, forming small mats consisting of several open rosettes joined by short slender caudicles, partly clothed in remnants of blade bases of marcescent leaves, or caudicles undeveloped; root blackish-brown, rather short, slightly branching at the end; leaves up to 10 mm long and up to 2 mm broad (?), linear-lanceolate to oblong-lanceolate, flat, entire, glabrous, the margins slightly involute and uniformly short-ciliolate, the blade sometimes appressed-pilose at apex, obtusish, rather dark green and often reddish above, pale glaucous-green beneath, more or less thickened and fleshy; scapes 1.6-6 (10) cm long, rather numerous in a mat, smooth, glabrate or with sparse short hairs, stoutish, bearing 3 or rarely 4-5 (7) flowers; bracts 5-8, up to 2 mm long,

oblong-lanceolate, glabrous, round-tipped and abruptly mucronate, saccate at base and here somewhat divergent from scape; pedicels up to 1.6-20 mm long, up to 2-5 times as long as the bracts, glabrous, sometimes abbreviated, and then flowers subsessile, crowded, the pedicels usually strongly elongating in fruit; calyx 5-parted to above the middle, glabrous, angled, campanulate, the broad lobes more or less subulate-tipped; corolla pale yellow, the pale sulfurous limb exceeding the calyx; capsule exceeding the calyx. June-July.

Stone-and-gravel and stone-and-moss tundra, shore pebbles, and dry clayey sites (often together with *Dryas*).—Arctic: Nov. Z., Arc. Sib.; E. Siberia: Dau. (N.), Lena-Kol. Endemic. Described from lower reaches of the Lena (Bykovskii Promontory). Type in Moscow.

Subsection 4. *ARETIA* (L.) Koch in Synops. Fl. Germ. (1837) 583, pro sect.; Endl. Gen. II, 730; Duby in DC. Prodr. VIII, 47; Ldb. Fl. Ross. III, 1, 16; Knuth. in Engl. Pflanzenr. IV, 237, 197.—*Aretia* L. Sp. pl. (1753) 141, pro gen.; Pax in Engl.—Pr. Pflanzenf. IV, 110.—Scapes undeveloped; flowers solitary, on short pedicels, terminal or often in lateral leaf axils; calyx glabrous.

17. *A. ochotensis* Willd. ex Roem. et Schult. Syst. IV (1819) 786; Cham. et Schlecht. in Linnaea, I, 221.—*A. tschuktschorum* Knuth in Engl. Pflanzenr. IV, 237 (1905) 200; Ldb. Fl. Ross. III, 1, 16.—*A. caespitosa* Knuth, l.c. 201 (excl. *plantae iranicae*), non L.—*A. Vegae* Knuth, l.c.

234 Perennial, pulvinate with mats up to 10 cm due to crowded palmately branched stolons, these profusely covered from base with reddish-brown and light brown leaf remnants and terminating in a leaf rosette; leaves 9-10 mm long, linear, somewhat attenuate toward apex but obtusish, pale green, often turning brown, mostly distinctly cross-wrinkled, slightly revolute, hirtellous throughout with occasional furcate hairs; peduncles 14-15 mm long, single-flowered, sometimes axillary; calyx stramineous-brownish, campanulate, the teeth mostly rounded-obtuse; corolla lobes lance-oblong or lance-ovate, the limb 5-6.5 mm across; capsule exceeding the calyx. June-July (Plate XIII, Figure 4).

Shore pebbles and stony slopes.—Arctic: Chuk., An.; E. Siberia: Lena-Kol. (N.); Far East: Okh. (N.). **Gen. distr.:** Ber. Described from the Okhotsk area. Type in Leningrad.

18. *A. arctica* Cham. et Schlecht. in Linnaea, I (1826) 220; Ldb. Fl. Ross. III, 1, 16; Knuth in Engl. Pflanzenr. IV, 237, 200.—*A. ochotensis* var. *arctica* Kurtz in Engl. Bot. Jahrb. XIX (1895) 469.—Ic.: Knuth, l.c. f. 47, B.

Perennial, grayish-green or cineraceous, with compact cushions up to 5-10 cm in diameter; leaf blades recurved; leaves oblong or oblong-linear, 4-5 mm long, ca. 1 mm broad, densely covered above with short branched and forked bristlelike hairs, ciliate on the margin, obtuse, the revolute base somewhat longer than the enlarged coriaceous amplexicaul finally reddish-brown base, glabrous beneath; peduncles single-flowered, barely rising above the leaf rosettes, 3-5 mm long, glabrous or slightly hairy; calyx glabrous, 5-parted to the middle, the oblong-ovate acutish teeth with a fairly prominent midrib; corolla limb 6-7 mm across, with oblong lobes; pedicels reddish-violet (?).

Stony tundra. — Arctic: Chuk. **Gen. distr.:** Ber. Described from the Lavrentia Bay area. Type in Leningrad.

Note. This species is authenticated only from the Lavrentia Bay area and from the islands of the Bering Strait.

Section 2. **PSEUDODOUGLASIA** Ovcz. — Sect. *Aretia* auct. ex p. — Calyx parted nearly to base.

19. **A. bryomorpha** Lipsky in Tr. Bot. Sada, XXIII (1904) 175; Knuth in Engl. Pflanzenr. IV, 237, 207; Fedch. O. and B. Perech. rast. Turk, 5, 8.

Perennial, forming small, very compact cushions consisting of tightly appressed columns, these slender, 5-15 mm long, densely covered with
235 imbricated leaves; leaves small, barely 1.5-2 mm long, appressed, oblong, glandular, with a prominent midrib, glandular-ciliate on the margin, the cilia not reaching the apex, the old leaves whitish-gray; flowers solitary, very small, partly concealed by the leaves; calyx projecting above the leaves, parted nearly to base, the sepals covered with scattered glandular bristles, oblong-lanceolate, distinctly nerved; corolla 4 mm across, apparently rose-colored, glabrous, the short tube equaling the limb, not exerted from the calyx; corolla lobes short, obovate-cordate, slightly denticulate; anthers on very short filaments, inserted at the middle of the corolla tube; capsule dehiscent down to base into 5 (sometimes 6 or 7) recurved valves; seeds solitary. Fr. August (Plate XIII, Figure 5).

Shaded rocks. — Soviet Central Asia: Pam.-Al. (known from a single site in W. Pamir). Endemic. Described from Odudi Ravine. Type in Leningrad.

Note. This remarkable plant, collected on a single occasion by Alekseenko (Odudi Ravine, near the villages of Khuchaz and Matraun) comes close in its characteristics to the genus *Dionysia*; it has, however, a short corolla tube not exceeding the calyx, like all species of *Androsace*.

Section 3. **SAMUELIA** Schlecht. in Bot. Zeit. (1856) 504. — *Pseudo-primula* Pax u. Knuth in Engl. — Pr. Pflanzenf. IV, 1 (1889) 110 p.p.; Knuth in Engl. Pflanzenr. IV, 237, 173. — *Andraspis* Duby, Bot. gall. I (1828) 381, p.p. — Annuals; leaves reniform-cordate or orbicular; petioles 3-4 times the length of the leaf blade.

20. **A. umbellata** (Lour.) Merr. in Philipp. Journ. Sc. XV (1919) 239. — *Drosera umbellata* Lour. Fl. Cochinch. (1793) 186. — *Androsace saxifragifolia* Bge. in Mem. Acad. Sc. Petersb. II (1833) 127; Kom. and Alis. Opred. rast. Dal'nevost. kr. II, 848. — *Primula minutiflora* Forrest in Not. Roy. Bot. Gard. Edinb. IV (1908) 219. — Ic.: Bge. l.c. tab. XXIX, A.

Annual; leaves cordate-reniform, dentate, hairy on both sides, long-petioled, the petiole 1-2 times the length of the blade; scapes 2-8 cm long, covered with stiff spreading hairs, bearing 5-14 flowers; pedicels 1-2 cm long, equal; bracts numerous, hairy, acute, ovate; corolla white, twice as long as the deeply cleft calyx.

Grassy sites; not extending far up into mountains.— Far East: Uss. (Suifenho on the frontier). **Gen. distr.:** Korea, continental China and Taiwan Island, Japan. Described from Cochinchina*. Type in Paris.

21. **A. Gmelini** (Gaertn.) Roem. et Schult. Syst. veg. IV (1819) 165; Ldb. Fl. alt. I, 217; Fl. Ross. III, 21; Turcz. Fl. baic.-dah. II, 234; 236 Kryl. Fl. Zap. Sib. IX, 2144; Hand.-Mztt. in Notes Bot. Gard. Edinb. XV, 272.— *Cortusa Gmelini* Gaertn. De fruct. et sem. plant. I (1788) 232.— Ic.: Gaertn. l.c. tab. L.; Lam. Illustr. I, tab. 99, f. 21; Ldb. Ic. pl. Fl. Ross. II, 22, tab. 170.

Annual; leaves 4-15 mm long and 7-18 mm broad, cordate-reniform, crenate-dentate, covered on both sides with almost bristly hairs, the petiole 1-3 cm long, 3-4 times the length of the blade, covered with bristlelike hairs; scapes numerous, slender, weak, covered with bristlelike hairs, bearing 3-5 flowers, 1.5-12 cm long, unequal; bracts 2-5, 1-2.5 mm long, ovate-lanceolate, acute; pedicels 2-5, unequal, from 2-3 to 35-50 mm long, one or two of them strongly elongating after anthesis and then about equal to or somewhat shorter or longer than the scape; calyx campanulate, slightly accrescent in fruit, densely hairy, parted to the middle, 3-4 mm long; sepals broadly ovate, acutish, prominently 3-5-nerved beneath, sub-horizontally spreading in fruit; corolla very small, white; petals obovate, barely exceeding the calyx, the limb 2-2.5 mm across; capsule obconic, up to 3 mm in diameter, about equaling the calyx. May-June.

Humid meadows, river valleys and banks, near brooks, more rarely on stony slopes, sometimes at roadsides and becoming a weed.—W. Siberia: Alt.; E. Siberia: Ang.-Say., Dau.; Far East: Ze.-Bu. **Gen. distr.:** Mong. China. Described from E. Siberia. Type in Berlin.

Section 4. **ANDRASPIS** (Duby) C. Koch, Synops. Fl. Germ. (1837) 585.— *Andraspis* Duby, Bot. gall. I (1828) 382, p.p.— Annual and biennial plants, with a single subradical rosette; leaves elliptic or lanceolate, sessile, if petiolate then the petiole about as long as the blade.

Subsection 1. **OREADES** Schischk. et Bobr.— Biennial high-mountain plants of the Caucasus.

22. **A. albana** Stev. in Mem. Soc. Nat. Mosc. III (1812) 255; Ldb. Fl. Ross. III, 17; Kuzn. in Mat. Fl. Kavk. IV, 1, 128; Grossg. Fl. Kavk. III, 210.— *A. valerianoides* Lehm. ex Spreng in Isis (1819) 1289.— Ic.: Stev. in Transact. Linn. Soc. XI, 410, tab. 33.— Exs.: GRF, No. 1077; Herb. Fl. Cauc. No. 344.

- Biennial, (5) 10-20 (30) cm tall; leaves oblong-spatulate or lance-spatulate, narrowed toward base, with simple or little branched papillose hairs mainly on the margin, coarsely and irregularly dentate in apical part; scapes erect, 3-5, many-flowered, equaling or 3-4 times as long as the 237 leaves, densely hairy especially toward apex, the hairs partly stellate; flowers rather numerous, subsessile, gathered in a subcapitate compact umbel; bracts lanceolate, hairy, acute, 6-8 mm long, greatly exceeding the pedicels; calyx white-hairy, the teeth triangular acute; corolla white or faintly rose-colored, the petals obovate or ovate-spatulate, the limb 6-7 mm across. June-July (Plate XIII, Figure 2).

* [South Vietman,]

Alpine meadows, taluses, and stony places in the high-mountain region, at altitudes of 1800-3600 m. — Caucasus: Cisc.; Dag., W. and E. Transc. Endemic. Described from the Caucasus. Type in Helsinki.

23. **A. bidentata** C. Koch in Linnaea, XXIII (1850) 610. — *A. longifolia* C. Koch l.c. — *A. Wiedemannii* Boiss. Fl. or. IV (1879) 16; Grossg. Opred. 598. — *A. albana* β . Wiedemanni Knuth in Engl. Pflanzenr. IV, 237 (1905) 211.

Biennial; differing from the preceding species in fewer-flowered heads, larger corolla lobes, and obtusish bracts.

Gravelly and stony high-mountain slopes. — Caucasus: W. Transc. (Batumi area). **Gen. distr.:** As. Min. (N. Anatolia). Cotype in Leningrad.

24. **A. armeniaca** Duby in DC. Prodr. VIII (1844) 52; Ldb. Fl. Ross, III, 19; Kuzn. in Mat. Fl. Kavk. IV, 1, 130; Grossg. Fl. Kavk. III, 210. — *A. pleioscapa* C Koch. in Linnaea, XXIII (1850) 611. — Exs.: Aucher-Eloy, Herb. d'Orient, No. 5231.

Biennial, 15 cm tall, covered with appressed branched substellate hairs; leaves 7-20 mm long, 3-5 mm broad, oblong-lanceolate, acute, narrowed toward base, cleft at apex more or less deeply into 2-5 sharp teeth, these covered especially on the margin with stellate or simple hairs; scapes numerous, barely exceeding the leaves, elongating in fruit and then 2-4 times the length of leaves; umbel 5-15-flowered; bracts saccate-auriculate at base, narrowly lanceolate, acuminate; pedicels shorter than the bracts, elongating after anthesis and then 2-3 times the length of bracts, erect or arched-recurved, glandular-pubescent; calyx having simple or stellate hairs and glandular-pubescent, with acute ovate-triangular teeth and a campanulate ribbed tube; corolla 5-6 mm across, white or rose-colored, the obovate limb equaling the tube. May-June.

Meadows in the high-mountain region, at altitudes of 1500-2700 m. — Caucasus: E. and S. Transc. **Gen. distr.:** Bal.-As. Min. (E.), Arm.-Kurd., Iran (NW part). Described from Erzurum. Type in Paris (?).

238 25. **A. macrantha** Boiss. et Huet, Diagn. ser. II, 3 (1856) 119; Kuzn. in Mat. Fl. Kavk. IV, 1, 132. — Exs.: Bornm. No. 1666b; Sint. It. Or. 1894, No. 5991; Bourgeau, Pl. Arm. 1862.

Biennial; differing from *A. armeniaca* in much larger flowers and conspicuous red glands covering the calyx and bracts; pedicels up to 3 times the length of the oblong acute bracts; scapes 7-12-flowered, many times the length of the leaves.

Possibly occurring in the USSR (known from Ardanuc in the former Artvin Province). **Gen. distr.:** As. Min., Arm.-Kurd. Described from Asia Minor, Type in Geneva.

26. **A. intermedia** Ldb. Fl. Ross. III (1847-1849) 20; Kuzn. in Mat. Fl. Kavk. IV, 1, 132; Grossg. Fl. Kavk. III, 211. — Exs.: Pl. or exs. No. 144.

Biennial; quite glabrous throughout except for the stiffly ciliate leaf margins; leaves oblong-lanceolate, narrowed toward base, dentate-serrate above the middle; bracts oblong or rounded-elliptic; pedicels 2-4 times the length of bracts; corolla exceeding the calyx, white or rose-colored, the lobes obovate. June-July.

Alpine and subalpine meadows and rocks at altitudes of 2100-2700 m. — Caucasus: W. Transc. Endemic. Described from Guria*. Type in Leningrad.

27. **A. Raddeana** Somm. et Lév. in Tr. Bot. Sada, XIII (1893) 49; XVI (1900) 330; Kuzn. in Mat. Fl. Kavk. IV, 1, 132; Grossg. Fl. Kavk. III, 211. — *A. caucasica* Somm. et Lév. in Gard. Chron. II (1892) 399, nom. — Ic.: Tr. Bot. Sada, XVI, Plate XXXIII.

Biennial, green, densely covered with small branched hairs; leaves somewhat thickish, linear, enlarged at apex and here rather deeply and sharply 2-4-toothed, glabrate; scapes 1-5, many-flowered, the inner scapes abbreviated and thickened, often obsolescent and then pedicels arising in a cluster directly from the leaf rosette, the outer ones ascending, 1-5-flowered, equaling or to about twice as long as the leaves; pedicels stoutish, arcuately ascending, unequal, mostly up to twice the length of bracts, these linear-lanceolate, up to 5-6 mm long; calyx angled, obconic, glabrate, with ovate-triangular teeth; corolla slightly exceeding the calyx, white or whitish-rose. May-July.

Moraines, stony and dry alpine meadows in the high-mountain region of the Greater and Lesser Caucasus, at altitudes of 2400-3600 m. — Caucasus: Cisc.; E. and S. Transc., Dag. Endemic. Described from the Caucasus. Type in Florence.

239 Subsection 2. **HAPLORHIZA** Ldb. Fl. Ross. III (1847) 18, pro sect. — Annual plants.

28. **A. elongata** L. Sp. pl. (1763) App. 1668; Ldb. Fl. Ross. III, 20; Kuzn. in Mat. Fl. Kavk. IV, 1, 136; Shmal'g. Fl. II, 197. — Ic.: Syreishch. Ill. Fl. Mosk. gub. III, 26; Maevsk. Fl. Ed. 7, 568.

Annual, 2-5 (12) cm tall; scapes, pedicels and bracts covered with simple and forked hairs or glabrate; leaves oblong-lanceolate, entire or with a few obtuse teeth; scapes numerous or solitary, short, erect, 2-8-flowered, mostly equaling the pedicels; pedicels very slender, like the leaf blades and calyx covered with forked hairs, several times as long as the bracts, elongating at the time of seed ripening and then about as long as the scapes, unequal; bracts oblong-lanceolate or linear, acute, 6-8 mm long; calyx 5-angled, the lanceolate acute teeth as long as the tube; corolla white, yellow in throat. Fl. June.

Fields, dry meadows and slopes, sandy slopes, steppelike sites, and river banks. — European part: V.-Kama, U. Dns., M.D., V.-Don, Transv., Bes., Bl. S., Crim., L. Don; Caucasus: Cisc., E. and S. Transc., Dag., Tal.; W. Siberia: Alt. (?); E. Siberia: Ang.-Say, Dau. **Gen. distr.:** Centr. Eur., Med., Mong., Jap.-Ch. Described from Europe. Type in London.

29. **A. lactiflora** Pall. Reise d. versch. Prov. Russl. III (1776) 244, 253, nom.; Duby in DC. Prodr. VIII, 52; Ldb. Fl. Ross. III, 18; Turcz. Fl. baic.-dah. II, 232; Kryl. Fl. Zap. Sib. IX, 2140. — *A. septentrionalis* var. *lactiflora* Trautv. in Bull. Soc. Nat. Mosc. I (1868) 62; Kryl. Fl. Alt. III, 817. — Ic.: The Garden, LXIII (1903) 332; Andrews, Bot. Repos. X, tab. 647. — Exs.: GRF, No. 325.

* [Area in W. Georgian SSR.]

Annual, glabrous, 10-30 cm tall; leaves 1.5-5 cm long, 2-5 mm broad, linear-lanceolate or linear-spatulate, acute, denticulate-margined, slightly narrowed to a petiolar base; scapes erect, few-flowered, glabrous or rarely slightly hairy; bracts linear-lanceolate or spatulate, acute, 1-5 mm long, somewhat connate at base; pedicels mostly few, usually unequal, 1-6 cm long, slightly flexuous, spreading; calyx broadly campanulate, angled, cleft barely to the middle, the teeth linear-triangular acute green; corolla milky-white, about twice the length of the calyx, the limb 8-14 mm across. Fl. June-July; fr. July-August.

240 Stony and gravelly steppe slopes; sometimes saline meadows, wood margins, precipitous coastlines, etc.—W. Siberia: Irt., Alt.; E. Siberia: all regions; Far East: Ze.-Bu.; Soviet Central Asia: Dzu.-Tarb., T. Sh. **Gen. distr.:** Dzu.-Kash., Mong. Described from Siberia. Type in London.

30. **A. Fedtschenkoi** Ovcz. in Izv. Glavn. Bot. Sada, XXXII (1931) 374; Kryl. Fl. Zap. Sib. IX, 2141.—*A. septentrionalis* var. *brevi-scapa* Kryl. in Fl. Alt. III (1904) 817.—*A. septentrionalis* var. *lactiflora* f. *nana* Derganc in Tr. Glavn. Bot. Sada, XXVIII (1912) 40 (nomen nudum et in sched. ad herb.).

Annual, 3-6 cm tall; root up to 7 cm long, slender, simple or slightly branched; leaves rather compactly rosulate, 0.5-1.5 cm long, 3-6 mm broad, oblong-lanceolate to linear-lanceolate, slightly denticulate, subacute, pubescent; scapes 3-8 or more numerous, 8-22 mm long, equaling or slightly longer or (more often) shorter than the pedicels or altogether absent, more or less curved, densely covered with white branching hairs; bracts up to 3 mm long, linear-lanceolate, pubescent, scarcely thickened, whitish-green, sometimes subconnate at base; pedicels numerous, mostly 35-40 mm long, divaricate, sometimes arched-recurved, pubescent, very rarely shorter than or about equaling the scapes; calyx rather narrowly campanulate, glabrate, parted to about the middle, ribbed, the linear-lanceolate acute teeth strict in fruit; corolla milky-white or yellowish-white, about twice the length of the calyx, the limb 4-6 mm across; style about one-fourth as long as the compressed-globose ovary; capsule oblong-globose or ovoid, about twice as long as the calyx; seeds angled, punctulate. May-July.

Alpine and subalpine meadows, rocks, and screes in the high-mountain region, at altitudes of 1800-4500 m.—W. Siberia: Alt.; Soviet Central Asia: Dzu.-Tarb., T. Sh., Pam.-Al. (rarely in Fergana, Turkestan, Alai, and Trans-Alai ranges and in Pamir). **Gen. distr.:** Dzu.-Kash., Mong. (mountainous W. part). Described from Soviet Central Asia. Type in Leningrad.

31. **A. septentrionalis** L. Sp. pl. (1753) 142; Ldb. Fl. Ross. III, 19; Shmal'g. Fl. II, 198; Mat. Fl. Kavk. IV, 1, 134; Fedch. O. and B. Perech. rast. Turk. 5, 9; Kryl. Fl. Zap. Sib. IX, 2138; Maeusk. Fl. ed. 7, 568; Syreishch. Ill. Fl. Mosk. gub. III, 26; Kom. Fl. Kamch. III, 26.—Ic.: Fedch. and Fler. Fl. Evrop. Rossii.

Annual; leaves lanceolate or oblong-lanceolate or linear-lanceolate, somewhat enlarged and more or less denticulate toward apex, glabrous or pubescent with short simple or branching furcate hairs; scapes numerous, many-flowered, up to 10-25 cm long or rarely obsolete, covered with short
241 slender branching hairs, finally becoming glabrate; bracts numerous,

small, linear-lanceolate, acute, not more than 2-3 mm long; pedicels many times the length of bracts, slender, regularly spreading, mostly strict, more or less equal; scapes several times the length of the pedicels; calyx campanulate, green, glabrous, more or less angled; corolla equaling or slightly exceeding the calyx, white, the limb 4-5 mm across. April-July.

Dry meadows, as weed in fields, and sandy places, in the forest and forest-steppe belts. — Arctic: Chuk. (adventive); European part: Kar.-Lap., Dv.-Pech., Balt., Lad.-Ilm., U. V., V.-Kama, U. Dns., M. D., V.-Don, Transv., Bl., L. Don., Bes., L. V.; Caucasus: Cisc., Dag.; W. Siberia: all regions; E. Siberia: all regions; Far East: Kamch., Okh. (?); Soviet Central Asia: Dzu.-Tarb., T. Sh. **Gen. distr.:** Scand., Centr. and Atl. Eur., Bal.-As. Min., Dzu.-Kash., Mong., Jap.-Chi., N. Am. Described from Europe. Type in London.

32. **A. filiformis** Retz. Obs. II (1781) 10; Ldb. Fl. alt. I, 216; Fl. Ross. III, 21; Turcz. Fl. baic.-dah. III, 301; Shmal'g. Fl. II, 198; Kryl. Fl. Zap. Sib. IX, 2143; Kom. Fl. Kamch. III, 25; Maevskii, Fl. ed. 7, 568. — *A. neglecta* Clerc in Bull. Soc. Nat. Mosc. XLX, 1 (1872) 430. — Ic.: Syreishch. Ill. Fl. Mosk. gub. III, 27.

Annual, pale green, smooth or in upper part with short glandular hairs, 3-25 cm tall; leaves elliptic to oblong-ovate, glabrous or sparsely covered with glandular hairs, dentate, the blade about as long as the petiole; scapes several, 5-20 cm long, few-flowered; pedicels numerous, 2-7 cm long, in fruit somewhat shorter than, or equaling, or sometimes longer than the scapes; bracts numerous, 1-2.5 mm long, sublinear, acute; calyx 2-2.5 mm long, broadly short-campanulate to subglobose, parted to the middle into triangular-lanceolate acute teeth; corolla somewhat exserted from the calyx, white, the limb 2-3.5 mm across; petals ovate-lanceolate, persistent capsule coriaceous, exceeding the calyx; seeds numerous. May-August.

Inundated and humid meadows, sandy and pebbly river banks, shores of lakes and brooks, grassy bogs, forest roads, sometimes damp pine woods and thin deciduous woods and coppices. — Arctic.: Arc. Sib. (rarely encountered in lower reaches of the Lena and Yenisei at 71°N), Chuk., An. (?); European part: Kar.-Lap., Dv.-Pech., Lad.-Ilm., U. V., V.-Kama, U. Dnp., M. D., V.-Don, Transv.; W. Siberia: Ob, U. Tob., Irt., Alt.; E. Siberia: Yen., Lena-Kol. Ang.-Say., Dau.; Far East: Kamch., Okh., Ze.-Bu., Uda, Uss., Sakh.; Soviet Central Asia: Balkh. (on the Kara-Irtysh*, Nor-Zaisan). **Gen. distr.:** Mong., Jap.-Chi. Described from E. Siberia. Type in Berlin.

- 242 Section 5. **MEGISTA** Schlechtd. in Bot. Zeit. (1856) 524. — Calyx strongly accrescent in fruit; bracts large; throat of corolla bare seeds numerous, small. Annual plants.

33. **A. Turczaninovii** Freyn in Oesterr. Bot. Zeitschr. XL (1890) 157. — *A. maxima* auct. fl. Ross. non L; Ldb. Fl. Ross. III, 20; Shmal'g. Fl. II, 197; Kryl. Fl. Zap. Sib. IX, 2141. — *A. maxima* var. *sibirica* Petunn. in Tr. Bot. Sada Yur'evsk. univ., I (1901) 63. — *A. maxima* var. *Turczaninnoyii* Kusn. in Mat. Fl. Kavk. IV, 1 (1902) 141. —

* [The Black Irtysh River, the Irtysh before it enters Lake Zaisan.]

A. maxima var. *caucasica* Kusn. l.c. 137; Grossg. Fl. Kavk. III, 210. — Exs.: GRF, No. 469.

Annual, rather sparsely covered with fairly long slender spreading hairs, the scape similarly vested and with short brownish glands; leaves elliptic or subrhomboid, entire, finely denticulate in upper part, narrowed to a broad petiolar base, in all 1-5 cm long and 3-20 mm broad; bracts oblong-lanceolate to narrowly lanceolate or oblong-obovate, rarely almost lanceolate, narrowed at base, obtuse or short-acuminate, 0.5-1.5 cm long, entire, round-tipped; pedicels 2-3 times the length of the bracts; scapes several, somewhat shorter to longer than the pedicels, 2-15 cm long; calyx long-pilose, 5-10 mm long, two-thirds cut into ovate-lanceolate entire teeth; corolla rose or white, about equaling or slightly exceeding the calyx, the limb 6-9 mm across.

Steppes, dry meadows, and as weed among crops. — European part: V.-Kama, Lad.-Ilm. (adventive), U. V. (adventive), U. Dnp., M. D., V.-Don, Transv., Bes., Bl., L. Don, Crim.; Caucasus: all regions; W. Siberia: all regions; E. Siberia: Ang.-Say., Dau., Lena-Kol; Soviet Central Asia: Ar.-Casp., Balkh., Dzu.-Tarb., Mtn. Turkm., Pam.-Al. (rarely), T. Sh. **Gen. distr.:** Mong. Described from Dauria. Type in Leningrad.

Note. Specimens of this species from the E. Altai, the Sayans and N. Mongolia are conspicuous in having a larger corolla which turns blue in drying; such plants were recorded under the name var. *grandiflora* Bge.

Genus 1119. **CORTUSA** * L. **

L. Sp. pl. (1753) 205.

243 Calyx parted to the middle or lower down into lanceolate teeth, campanulate; corolla turbinate-campanulate, mostly parted to below the middle, the lobes ovate-obtuse or slightly pointed; corolla tube very short, indistinct; stamens 5, attached at the base of corolla, the filaments connate at base forming a kind of a ring; anthers cordate at base, acuminate; ovary ovoid; ovules numerous, semianatropous; style filiform, exserted, with a small capitate stigma; capsule ovoid, dehiscing with 5 valves, many-seeded; seeds compressed-globose, the surface minutely rugulose. Perennial herbs, commonly pubescent; leaves all subradical, abruptly narrowed into a long petiole; leaf blades cordate-orbicular or reniform, lobed, dentate; scapes bearing an umbellate inflorescence with unequal rays; flowers rosy-violet.

The genus *Cortusa* is often regarded as monotypic, but it contains in fact several rather distinct geographical races, comprising a single genetic series and replacing one another over the Asian continent, from Central Europe to the Himalayas, China, the Far East, and the islands of Sakhalin and Japan. This genus contains not less than ten satisfactorily distinguishable species, some not yet described.

1. Leaf blades deeply lobed, up to one-third of the diameter, sometimes subpalmate, incised-dentate, not exceeding 5 cm in diameter, covered beneath and on the petiole with scattered glandular hairs; calyx violet-tinged, with narrow almost subulate lanceolate teeth; corolla up to 0.7 cm long. 1. **C. pekinensis** (Al. Richter) A. Los.

* Genus named for J. Cortusus, director of the Botanical Garden in Padua (dec. 1593).

** Prepared by An. A. Fedorov.

- + Leaf blades with obtuse rounded or triangular lobes amounting to not more than a quarter of the diameter, with large or small blunt or sharp teeth, but not incised-dentate. 2.
- 2. Small plants, usually not more than 20-25 cm tall; leaf blades not exceeding 4-5 cm in diameter, regularly rounded-reniform, with rounded finely dentate lobes, cineraceous beneath; corolla large, up to 1-2 cm in diameter and about as long; calyx green, with broadly lanceolate subtriangular teeth. 2. **C. Brotheri** Pax.
- + Larger plants, sometimes robust, up to 50 cm tall; leaf blades mostly more than 7 cm and sometimes up to 10 cm in diameter 3.
- 3. Plants almost glabrous or with pubescence discernible only with the aid of a magnifying glass 4.
- + Plants hairy or with pubescence visible to the naked eye 6.
- 244 4. Plant slender, delicate, not more than 30 cm tall; inflorescence few-flowered; scapes slender, weak, not more than 1 mm thick; leaves thin, up to 7 cm in diameter, with triangular coarsely dentate lobes. 5. **C. altaica** A. Los.
- + Plants robust, up to 30-60 cm tall; inflorescence many-flowered, containing up to 25 flowers; scapes stout, to 3-3.5 mm thick; leaves large, up to 10 cm in diameter, with obtuse bluntly dentate lobes. 5.
- 5. Flowers large, up to 1.5 cm long; leaf teeth mucronulate 3. **C. turkestanica** A. Los.
- + Flowers rather small, 0.7-1.0 cm long; leaf teeth blunt, without a mucro 4. **C. amurensis** Fedt.
- 6. Plants up to 50 cm tall; leaves up to 7 cm in diameter, sharply or bluntly lobed-dentate, more or less pubescent, often cineraceous beneath; flowers purple (E. Siberia) 6. **C. sibirica** Andr.
- + Plants not more than 35-40 cm tall; leaves shaped like those of the preceding species but with denser pubescence especially on the petioles, the hairs spreading ferruginous (European part of the USSR, to the Urals in the east, Carpathians) 7. **C. Matthioli** L.

1. **C. pekinensis** (Al. Richter) A. Los. in Tr. Bot. Inst. AN SSSR, ser. 1, 3 (1936) 250.—*C. pekinensis* Kom. et Aliss. Oprod. rast. Dal'nevost. kr. II (1932) 848 (nomen).—*C. sachalinensis* A. Los. l.c. 248.—*C. Matthioli* f. *pekinensis* Al. Richter in Termesztet. Füzetek, XVII (1894) 199; Knuth in Engl. Pflanzenr. IV, 237, 221.—*C. Matthioli* var. *chinensis* Al. Richter in sched. et apud Knuth, l.c. 221.—*C. Matthioli* auct. Fl. or. extr. non L.; Kom. Fl. Man'chzh. III, 1, 227; F. Schmidt, Reise nach Sachal. (1868) No. 319; Sugawara, Ill. Fl. of Saghal. IV, 1520.—Ic.: Al. Richt. l.c. f. 3; A. Los. l.c. f. 2 (8.9), 4 (8,9); Sugawara, l.c. 1521.

Perennial; up to 55 cm tall; leaves long-petioled, rounded ovate-reniform, lobed to 1/3 of the diameter, the lobes triangular or subrhomboid, deeply incised-dentate; leaf blades covered above with scattered glandular hairs, sometimes slightly tomentose beneath; petioles pubescent, 2-3 times the length of the blade; scapes often more than twice as long as the leaves, rather slender, both scapes and leaf petioles covered with ferruginous hairs; inflorescence umbellate, containing up to 10 fairly small flowers; bracts palmate, incised-dentate at apex, up to 0.5-1 cm long; pedicels slender and long, subfiliform, glandular, unequal; calyx campanulate, glandular,

violet-tinged, the narrow teeth almost subulate-lanceolate; corolla funnelform, with obtuse lobes; capsule ovaloid-ellipsoid, shorter than the
245 calyx, accrescent in fruit. June-July (Plate X, Figures 1, 1a, 1b, 1c).

Forest altitude-zone, on damp rocks, along banks of mountain streams. — Far East: Uda (De-Kastri Bay), Uss. (Sikhote-Alin), Sakh. **Gen. distr.:** N. China. Described from China (Syao-Khu-Taidzhan Mts., Dzhao-ling Pass, Chihli* Province). Type in Leningrad.

Note. Sakhlins plants, described by A.S. Lozina-Lozinskaya as a distinct species *C. sachalinensis*, differ from the Chinese in the occasionally less developed leaf pubescence.

2. ***C. Brotheri*** Pax ex Lipsky in Tr. Bot. Sada, XVIII (1901) 87; A. Loz. in Tr. Bot. Inst. AN SSSR, ser. 1, 3, 236. — *C. himalaica* A. Los. l.c. 238. — *C. Matthioli* f. *Brotheri* (Pax) Knuth in Engl. Pflanzenr. IV, 237 (1905) 221; Podpera in Beih. z. Bot. Zentralbl. XXXIX, 2, 287. — *C. Matthioli* Hook. Fl. Brit. Ind. (1882) 501, non L. — Ic.: A. Loz. l.c.

Perennial, small plants, usually not more than 20-25 cm, rarely up to 30 cm tall; leaves regularly rounded-reniform, rather small, up to 4-5 cm in diameter, abruptly narrowed from a deeply cordate base into a long petiole, with round denticulate lobes, the teeth blunt or fairly sharp, the blade dark green and glabrate above, cinerous or glaucous and more or less hairy beneath, the petiole covered with short hairs; scapes usually twice as long as the leaves, glabrate; inflorescence umbellate, often one-sided, short-rayed, containing 5-8 (10) flowers; bracts palmate incised-dentate; pedicels markedly unequal, rather slender and relatively short; calyx glabrous, with triangular-lanceolate teeth; corolla large, funnelform, 1.2 cm across and as long, rosy-violet, the lobes oblong obtuse; capsule oblong-ovoid, slightly exceeding the calyx. May-July.

At the timberline in mountains, in the shade of rocks. — Soviet Central Asia: Dzu.-Tarb., T. Sh. **Gen. distr.:** Kash., Tib., Him. (W.). Described from Aleksandrovskii Range (source of the Shanyssa River). Type in Leningrad.

Note. We do not find any substantial difference between the Himalayan plants, described by A. Lozina-Lozinskaya under the name *C. himalaica* A. Los., and those of Soviet Central Asia, i.e., typical *C. Brotheri* Pax.

3. ***C. turkestanica*** A. Los. in Tr. Bot. inst. AN SSSR, ser. 1, 3 (1936) 239. — *C. Matthioli* Vved. in Sched. ad HFAM, XII (1927) No. 284, non L. — Ic.: A. Los. l.c.f. 1 (3), 3 (1).

Perennial, minute, vested with partly glandular pubescence visible only under a magnifying glass; robust plants, up to 60 cm tall; leaves with a very long distinctly winged petiole, up to 40 cm long; leaf blades large, up to 10 cm in diameter, rounded ovate-reniform, with obtuse round
246 coarsely dentate lobes, the blunt teeth short-setaceous; scapes stout, ca. 3-3.5 mm thick, bearing a many-flowered umbellate inflorescence; bracts oblong-lanceolate, incised-dentate, up to 1 cm long; pedicels slender, unequal, some up to 5 cm long, others strongly abbreviated, slightly nodding; flowers fairly large, violet; calyx funnelform, with

* [Hopeh, since 1928.]

triangular-lanceolate acutish teeth; corolla 2-2 1/2 times the length of the calyx, funnelform, with oblong round-tipped lobes; capsule ellipsoid, markedly longer than the calyx. June-July (Plate X, Figures 2, 2a, 2b).

The upper forest zone, along the banks of streams, in the shade of rocks, and in damp rubble, especially limestone. — Soviet Central Asia: Pam.-Al., T. Sh. Endemic. Described from W. Tien Shan (Bol'shoi Chimgan). Type in Leningrad.

4. *C. amurensis* Fed. in Addenda, XVII, 731.

Perennial, glabrate, obscurely vested with rather sparse and very short hairs (discernible under a magnifying glass), with an oblique rootstock furnished with dark brown fibrous roots; leaves all subradical, large, 8-10 cm long, 7-9 cm broad, thin, rounded-reniform, bluntly lobed-dentate, the lobes round, the teeth rounded-triangular, the blade sparsely covered especially beneath with short hairs, abruptly narrowed from a cordate base into a long narrowly winged petiole, the petiole 2-3 times the length of the blade; scapes approximately half as long again as the leaves, sparsely pilulose, fairly stout, terminating in a many-flowered umbellate inflorescence; flowers rather small, violet; bracts oblong-palmate, incised-dentate at apex; pedicels slender, filiform, unequal, minutely glandular; calyx campanulate, parted to the middle, the narrowly lanceolate acute teeth minutely glandular-pilose; corolla funnelform, 0.7-1 cm long, with obovate lobes, more than twice the length of the calyx; capsule ovoid, hairy, as long as the calyx. June.

Among damp moss-covered stones, along brooks, in the forest zone. — Far East: Ze.-Bu. Endemic. Described from Tukuringra Range, above the Zeya River (Amur basin). Type in Leningrad.

Note. Differing little from the Turkestanian *cortusa*, from which it is distinguishable only by the small flowers and different leaf dentation. It cannot, however, be included in *C. turkestanica* in view of the geographic disjunction.

5. *C. altaica* A. Los. in Tr. Bot. inst. AN SSSR, ser. 1, 3 (1936) 243; 247 Bobr. in Fl. Yugo-vost. VI, 29, ex p.; Kryl. Fl. Zap. Sib. IX, 2145. — *C. mongolica* A. Los. l.c. 246. — *C. Matthioli* f. *sibirica* Podpera in Beih. z. Bot. Zentralbl. XXXIX, 2 (1923) 287, p.p. — *C. sibirica* Borbas in Oesterr. Bot. Zeitschr. XXXIX (1889) 140, ex p. — *C. Matthioli* Bge. in Ldb. Fl. alt. I (1829) 206, non L.; Ldb. Fl. Ross. III, 22; ex p.; Kryl. Fl. Alt. III, 821; Knuth in Engl. Pflanzenr. IV, 237, 221, ex minima parte. — Ic.: A. Los. l.c.f. 2 (5, 6), 4 (5, 6). — Exs.: Martianow, Pl. Minuss. exs. No. 663 (sub *C. Matthioli*).

Perennial, slender in all its parts, practically glabrous throughout or rarely sparsely pubescent; up to 30 cm tall; leaves together with petiole up to 20-25 cm long; leaf blades rounded-reniform, deeply lobed and coarsely dentate, up to 5-7 cm in diameter, thinly membranous, green on both sides, the lobes rounded-triangular; scapes slender, ca. 1 mm thick, bearing a few-flowered umbellate inflorescence; bracts oblong, sharply toothed at apex; pedicels slender, filiform, unequal, 0.5-2 cm long; flowers fairly large, rosy-violet; calyx broadly funnelform, with lance-triangular acute teeth; corolla more than twice the length of the calyx, up to 1 cm long,

the obovate lobes obtuse to slightly pointed; capsule ovaloid, about twice as long as the calyx. June-July.

The taiga mountain-zone, on damp shady rocks, rarely also in alpine meadows. — European part: V.-Kama; W. Siberia: U. Tob., Ob, Alt.; E. Siberia: Ang.-Say., Yenisei. **Gen. distr.:** N. Mongolia. Described from the Kuznetsk Ala Tau (Tygiri-Tysh Range). Type in Leningrad.

Note. We also include under the name *C. altaica* A. Los. the Mongolian plants described by A. S. Lozina-Lozinskaya as a separate species *C. mongolica* A. Los. In our opinion they do not differ from the plants of the Altai and Sayans. It may be assumed that *C. altaica* extends west as far as the Urals, but certainly no farther, since already in the Urals it is replaced by the European *C. Matthioli* L. which is here represented by forms strikingly similar to, e.g., the Carpathian *cortusa*. In the east *C. altaica* extends to the Baikal Range.

6. ***C. sibirica*** Andrzej. apud Besser in Beibl. I z. Flora, XVII (1834) 22; Steud. Nomencl. ed. 2, 423; Borbas in Oesterr. Bot. Zeitschr. XXIX (1889) 140, ex p.; Freyn, ibid. XLVI (1896) 53; A. Loz. in Tr. Bot. inst. AN SSSR, ser. 1, 3 (1936) 245. — *C. Matthioli* Turcz. Fl. baic.-dahur. II, 2 (1856) 236, non L. — *C. Matthioli* f. *sibirica* Podp. in Sb. Kl. Přír. Brno, III (1920) 18, p.p.; id. Beih. z. Bot. Zentralbl. XXXIX, 2, 281, ex p. — *C. jacutica* A. Los. l.c. 241. — Ic.: A. Los. l.c.f. 1 (4), 2 (7), 3 (4), 5 (7).

Perennial, usually up to 40 cm tall, rather densely pubescent; leaves
248 rounded ovate-reniform, glabrate above, mostly cinerescent due to dense hairs or rarely green with sparse and minute pubescence, 5-6 (7) cm in diameter, with round or somewhat pointed lobes, sharply or bluntly dentate; petioles 3-4 times the length of the blade, very narrowly winged; scapes rather slender, covered with spreading hairs or faintly pubescent; inflorescence umbellate, commonly few-flowered; flowers fairly small, purple; bracts oblong, incised-dentate at apex; corolla more than twice as long as the calyx (in the type 3 times the length of the calyx), funnelform, with oblong obtuse lobes; capsule twice as long as the calyx. June-July.

Coniferous taiga, banks of streams, rock crevices, sometimes among damp moss-covered stones. — E. Siberia: Dau., Lena-Kol.; Far East: Ze.-Bu., Uss., **Gen. distr.:** N. Mong. ? Described from mountains of Transbaikalia. Type in Kiev; cotype in Leningrad.

Note. The least distinct *Cortusa* species occurring in the USSR. Yakut specimens were placed in a separate species, *C. jacutica* A. Los., but they resemble closely the typical sample of *C. sibirica* (cotype). The Siberian *cortusa* apparently hybridizes in the Lake Baikal area with the Altai *cortusa*, and in the Far East with the Amur and Peking *cortusas*; this would explain its morphological variability.

7. ***C. Matthioli*** L. Sp. pl. (1753) 144; Ldb. Fl. Ross. III, ex p.; Korsh. Tent. fl. Ross. or. 286, ex p.; Fedch. and Fler. Fl. Evrop. Rossii, 735; Shmal'g. Fl. II, 194, ex p.; Kaufm. Mosk. Fl., Ed. 2, 419; Syreish. Ill. Fl. Mosk. gub. III, 30; Perfil'ev, Fl. Sev. Kraya, II-III, 262; Maevskii, Fl., Ed. 7, 569; Knuth in Engl. Pflanzenr. IV, 237, 221, ex p. — *C. sibirica* Baenitz in Sched. Herb. Europ. (exs.). — *C. Matthioli* var. *sibirica* Sagorsky et Schneid. Fl. Central-Carp. II (1891) 383, p.p. —

C. Matthioli f. *sibirica* Podp. Sb. Kl. Přir. Brno, III (1920) 63 et in Beih. z. Bot. Zentralbl. XXXIX, 2 (1923) 235, ex p. — *Androsace primuloides* Moench, Meth. Suppl. (1802) 152. — *Primula Matthioli* Richter in Termés-zetrajzi Füzetek, XVII, 3-4 (1894) 189. — *P. cortusa* Sandor ex Richter, l.c. — Ic.: Perfil'ev, l.c.f. 78; Syreishch. l.c. — Exs.: L. Vagner, Fl. d. Marmaros (sine numero); Domin et Krajina, Fl. Čechoslov. exs. No. 80.

Perennial, up to 35 or rarely 40 cm tall, covered with spreading ferruginous hairs, especially on the petiole; leaves 5-7 or rarely 9 cm in diameter, rounded-reniform, obtusely lobed-dentate, pubescent, the lobes up to a quarter the diameter, rather coarsely dentate, the teeth rounded-triangular; scapes commonly not more than twice the length of the leaves, hairy; inflorescence containing at most 10-15 flowers; bracts oblong-
249 palmate, incised-dentate at apex, up to 0.7 cm long; pedicels slender, unequal, up to 5 cm long; calyx funnelform, with narrowly lanceolate acute teeth; corolla twice the length of the calyx, funnelform, purplish-violet, the lobes oblong obtuse; capsule ovoid. June-July.

Woods, rocks in the forest zone, chiefly calcareous, and banks of brooks. — European part: U. Dns. (Carpathians), Dv.-Pech., V.-Kama, Transv., U.V. (Moscow Region, rare!). **Gen. distr.:** W. Eur. Described from W. Europe. Type in London.

Note. Owing to scarcity of herbarium material, we do not unfortunately have adequate information concerning the perfectly typical *C. Matthioli* L., especially in view of the fact that in Western Europe, whence the species was described, *Cortusa* is clearly differentiated, as in the USSR, into a number of local races. The race distributed in the plains of the USSR and extending east as far as the Urals is practically indistinguishable from the Carpathian *Cortusa* (such as grows in the USSR, for instance, in the Marmarosh Mountains). But already in the Carpathians there are at least two species of *Cortusa*, of which one was described long ago as a separate species. Our retention of the Linnaean name for the Russian *cortusa* is therefore merely temporary. In view of the foregoing considerations, the European monographs and most of European exsiccatae have not been cited.

Tribe 2. SOLDANELLEAE (Pax) Fed. comb. n.; Pax in Engl. — Pr. Pflanzenf. IV, 1 (1809) 104, 111, pro subtr. — Corolla lobes deeply lacinate; capsule circumscissile; aestivation imbricate; ovary superior; plants with rosulate leaves and leafless scapes.

Genus 1120. **SOLDANELLA** * L.**

L. Sp. pl. (1753) 144; Vierhapper in Oesterr. Bot. Zeitschr. LI (1901) 103; Borbas in Beih. z. Bot. Centralbl. X, 4-5 (1901) 279; Knuth in Engl. Pflanzenr. IV, 237 (1905) 224. — *Golia* Adans. Fam. II (1763) 231.

Scapes solitary or few, single or many-flowered; flowers in umbels, mostly azure or lilac, rarely white, nodding; calyx 5-parted, with

* Name derived from the word *solidus* (Italian *soldo*), referring to the leaf shape recalling a coin known by this name, or from the Italian word *soldana* (Latin *sultana*) in reference to the corolla which is cut up into narrow lobes.

** Prepared by L. A. Smol'yaninova.

lanceolate or linear lobes, persistent in fruit; corolla exceeding the calyx, campanulate, fimbriate-lacerate with many lobes or lacinate 10-lobed, the throat naked or with 5 emarginate scales; ovary superior, ovoid; style filiform; stigma capitate; placenta oblong; ovules numerous, semi-anatropous; stamens 5, attached at the throat between the scales, the filaments very short, the anthers cordate-oblong, acuminate, with prominent connectives; fruit a unilocular many-seeded oblong-conic capsule, with persistent style, dehiscing with 5-10 apical teeth; seeds numerous, very small, subreniform, the coat smooth or reticulate. Herbaceous perennials, rhizomatous, low, glabrous, scapose; leaves subradical, petiolate, reniform or orbicular, entire or crenate.

Of the 11 species inhabiting the high-mountain regions of Central and Southern Europe (from the Pyrenees to the Balkans), a single species, *S. montana* Mikan, occurs in the USSR.

Note. In 1899, V.I. Lipskii described the species *S. armena* Lipsky. The type of the species is preserved in Tbilisi. An illustration of this species, produced by Klinge, is kept in the herbarium of the Botanical Institute of the Academy of Sciences of the USSR in Leningrad.

According to V.I. Lipskii (Fl. Kavkaza (1899) 387), *S. armena* Lipsky resembles in shape *S. minima* Hoppe, from which it differs in non-acuminate anthers, glabrous pedicels, and the dingy white corolla cleft to 1/5 its length. The corolla of *S. minima* Hoppe is pale lilac, cleft to 1/3 of the length, and its pedicels are pubescent. Lipskii was of the opinion that all species of the genus *Soldanella* differ from each other merely in relative characteristics. However, taking into consideration the most unexpected occurrence so far east, he decided to describe this plant as a distinct species, and that in spite of the availability of only one specimen. This specimen of *S. armena* Lipsky is supposed to have been collected by B.G. Levandovskii in June 1896 on Mt. Kapydzhik (Nakhichevan ASSR), in the alpine zone, at an altitude of 3750 m. In 1897, Levandovskii was unable to find this plant again in the same place. It was not found by any of the later botanists who visited Mt. Kapydzhik, such as B.B. Grinevetskii, A.B. Shelkovnikov, S.G. Tamanshyan, An.A. Fedorov, A.L. Takhtadzhyan, P.D. Yarovshenko, and I.I. Karyagin. According to An.A. Fedorov (Izv. Arm. fil. AN SSSR, 4-5 (1940) 218), *S. armena* Lipsky is an erroneously described species and it should be deleted from the plant list of the Caucasian flora, and this was in fact done by A.A. Grossheim (Opred. rast. Kavkaza, 1949).

Economic importance. An early flowering ornamental, grown in rockeries.

1. *S. montana* Mikan in Pohl, Tentam. Fl. Boh. I (1809) 191; Vierh. in Aschersons Festschrift, 505; Knuth in Engl. Pflanzenr. IV, 237, 226, f. 51; A; Szaf. Kulcz. Pawl. Rosl. polskie, 468; Popov, Rast. i Fl. Karpat, 222.—*S. hungarica* Simk. Enum. Fl. Transsylv. (1866) 461.—
251 1c.: Rchb. Ic. Germ. XVII, tab. 46, f. III; Hegi, Ill. Fl. V, 3, f. 2826, b-c, f. 2827, h-i, 2828, d-e.—Exs.: Fl. exs. Austro-Hung. No. 1359; F. Petrak, Fl. Bohem. et Morav. exs. No. 771; Dörf. Herb. norm. No. 4934.

Perennial; leaves suborbicular or rounded-reniform, deeply cordate at base, revolute, broadly and obscurely crenate, 1-5 cm long and 1.5-6 cm

puncticulate beneath; petioles covered with long glandular hairs, often glabrate, 3-10 cm long; scape erect, 3-10-flowered, mostly 3-6-flowered, 7-15 cm long, elongation to 15-30 cm in fruit, glandular-puberulous; flowers nodding, in umbels, the bracts at the base of the umbel as many as the number of flowers, 4-8 mm long, linear-lanceolate, 1-1.5 mm broad, short-acuminate; pedicels 3-10 mm long, 20-50 mm long in fruit, densely covered with short-stalked glandular hairs; calyx deeply 5-parted, 2.5-3 mm long, the lobes linear, 0.5-0.75 mm broad, short-pointed or obtusish; corolla broadly campanulate, azure or azure-lilac, rarely white, 5-17 mm long, parted up to or above the middle into 10 linear-lanceolate acuminate lobes, of these five 3-lobulate alternating with five simple lanceolate ones, the scales in throat large bilobed attached between the stamens; style exceeding the corolla, violet-tipped; stigma capitate, very small; anthers cordate-oblong, acute, point-tipped, azure, 0.75 mm broad, 2-3 mm long, excluding the point; filaments 1 mm long, broad, flat; fruit a cylindrical capsule, somewhat attenuate at apex, 8-18 mm long, dehiscent with 10 apical teeth; seeds ovaloid or ovoid or subreniform, very small, 0.75-1.5 mm long and 0.5-1 mm broad, angled, brown, the surface reticulate. Fl. May-June; fr. August.

Humid coniferous woods, coppices, and forest glades, in the medium-altitude and subalpine zones, from 800 to 1600 m. — European part: U. Dns.

Gen. distr.: W. Med., Bal., Centr. Eur. Described from Europe. Type in Vienna?

Note. A closely related species, *S. hungarica* Simk., reported for the E. Carpathians (Szaf. Kulcz., Pavl. Rosl. polskie), is distinguishable from *S. montana* Mikan by the smaller number of flowers in the inflorescence (1-3), smaller leaves (1-2.5 cm in diameter) and smaller scales in the corolla throat. Considering the insignificant and purely quantitative differences, *S. hungarica* should be regarded as a synonym of *S. montana* Mikan.

Tribe 3. **HOTTONIEAE** (Rchb.) Endl. Gen. (1839) 734; Rchb. Fl.

Germ. exsc. (1832) 398, pro subtr. — Corolla lobes entire; corolla rotate; 252 aestivation imbricate; capsule dehiscent with valves; ovary superior. Plants with pectinately pinnatisect leaves and inflorescences borne on long peduncles.

Genus 1121. **HOTTONIA** * L. **

L. Sp. pl. (1753) 145. — *Breviglandium* Dulac, Fl. Hautes-Pyr. (1867) 423.

Peduncle erect, long, emerging above water; internodes of equal thickness or inflated; inflorescence racemose; flowers verticillate, regular, 5-parted, dimorphous (heterostylous), pedicellate, shorter than to as long as the pedicels, white or rosy; calyx deeply parted, persistent in fruit, equaling or exceeding the corolla tube; corolla rotate, the tube short, the limb flat, the lobes obovate, oval or oblong, entire or emarginate;

* Named for the botanist Peter Hotton, professor at Leiden University.

** Arranged by L.A. Smol'yanikova.

stamens 5, attached in the corolla tube, the filaments very short; anthers oblong or ovoid-oblong; ovary ovoid or globose; placenta globose; style long, filiform; stigma obtusish; ovules numerous, anatropous; fruit an ovoid or spherical capsule, dehiscent with 5 valves, these fused at apex and at base; seeds numerous, ovaloid, subangular. Aquatic perennials, with submerged verticillate pectinately pinnatifid or pinnatisect leaves.

The genus contains two species — *H. palustris* L., distributed through Europe and Asia Minor, and *H. inflata* Ell., distributed through eastern North America.

1. *H. palustris* L. Sp. pl. (1753) 145; Ldb. Fl. Ross. III, 7; Boiss. Fl. or. IV, 5; Shmal'g. Fl. II, 194; Szaf. Kulcz. Pawl. Rosl. polskie, 465. — *H. millefolium* Gilib. Fl. lithuan. I (1781) 33. — *Breviglandium palustre* Dulac, Fl. Hautres-Pyr. (1867) 423. — Ic.: Knuth in Engl. Pflanzenr. IV, 237, f. 54. — Exs.: GRF, No. 721; Fl. exs. Austro-Hung. No. 623.

Perennial, aquatic, leaves in whorls of 2-6, bright green, pectinately pinnatisect into narrow linear acute lobes, glabrous, 8-20 cm long; peduncle solitary, erect, initially short, then gradually elongating and not infrequently reaching up to 45-60 cm, emerging above the water, glandular-pubescent, in upper part, the internodes of equal thickness not inflated; inflorescence racemose, consisting of 3-10 flower whorls; flowers in whorls of 3-6, large, dimorphous (heterostylous); flowers declined, 3-18 mm long, glandular-pubescent; bracts at the base of whorls linear, 6-10 mm long, 253 as many as the number of flowers; calyx 3-6 mm long, deeply 5-parted (to $\frac{3}{4}$ the length) into linear narrow (1 mm broad) subacuminate lobes, glandular-pubescent, persistent in fruit; corolla rotate, 10-13 mm long, white or rose or lilac, yellow at the throat, the tube as long as the calyx, the flat limb 1.5-2 cm in diameter; corolla lobes obovate or oval or oblong, up to 7-8 mm long, 4-5 mm broad, obtuse, entire or slightly emarginate, glandular-puberulous at base; anthers oblong, 1 mm long, the filaments 1 mm long; ovary ovoid or globose; style filiform, 5-6 mm long; style small, obtusish; ovaries numerous, anatropous; placenta globose; fruit an ovoid or subglobose capsule, 4-5 mm long and 3-4 mm broad, with persistent style, dehiscent with 5 valves, these fused at base and at apex; seeds numerous, very small, 0.5 mm long, irregular or oval, angled, the coat minutely papillose. Fl. May-June; fr. July-August.

Standing or slowly flowing water, in ditches, ponds, river branches, canals, and bogs. — European part: all regions (except the regions Kar.-Lap., Dv.-Pech., Transv., L. V., and Crim.). **Gen. distr.:** Scand. (S. and Centr. Sweden), Atl. and Centr. Eur., Med. (N. and Centr. Italy, France), Bal.-As. Min. Described from Europe. Type in London.

Note. *H. palustris* L. differs markedly from the American species *H. inflata* Ell. in noninflated internodes, the calyx equaling the corolla tube, and pedicels exceeding the bracts. In *H. inflata* Ell., the internodes are inflated, calyx exceeding the corolla, and pedicels equaling the bracts.

Tribe 4. **SAMOLEAE** Rchb. Fl. Germ. exsc. (1832) 411. — Corolla rotate, the tube short, the lobes entire, alternating with 5 scalelike staminoids; aestivation imbricate; capsule dehiscent with valves; ovary half-inferior. Herbs with leafy stems and terminal racemose inflorescence.

Flowers small, in many-flowered terminal racemes or corymbs, regular, white, pedicellate; bracts attached at the base, at the middle, or
 254 on the upper part of the pedicel, sometimes wanting; calyx campanulate, 5-toothed, persistent in fruit, fused with the ovary at base or up to the middle; corolla perigynous, 5-parted, subcampanulate, with a short tube; corolla limb rotate, erect or horizontal, with emarginate lobes; stamens 5, attached in the corolla tube opposite the lobes, the filaments short; anthers ovoid-cordate, obtuse or acute; staminoids borne at the throat, subulate or ligulate, as many as stamens, alternating with corolla lobes; ovary half-inferior, globose; style short; stigma flattened or capitate; ovules numerous, semianatropous; fruit a unilocular many-seeded ovoid or globose capsule, dehiscing with 5 apical valves; seeds numerous, round or angular. Glabrous herbaceous perennials; stems simple or branched; leaves alternate, the lower ones sometimes rosulate, linear, oblong, spatulate, or obovate, entire, the basal petiolate, the cauline sessile or short-petioled.

Of the 16 species of this genus, 9 inhabit the maritime countries of the southern hemisphere (S. America, Australia, and the Cape region), 6 species occur in N. America, one species in Mexico, and one species (*Samolus Valerandi* L.), which occurs in the USSR, is distributed through the temperate and warm countries of the northern hemisphere, chiefly in coastal areas.

1. **S. Valerandi** L. Sp. pl. (1753) 443; Ldb. Fl. Ross. III, 31; Boiss. Fl. or. IV, 5; Shmal'g. Fl. II, 202; Mat. Fl. Kavk. IV, 1, 143.—*S. aquaticus* Lam. Fl. franc. III (1778) 329.—*S. bracteatus* Stokes, Bot. Mat. Med. I (1812) 344.—*S. geniculatus* Dulac, Fl. Hautes-Pyr. (1867) 422.—Ic.: Lam. III. des genres (1791) 443, tab. 101; Rchb. Ic. Fl. Germ. tab. 1083.—Exs.: Rchb. Fl. Germ. exs. No. 2202; GRF, No. 2032.

Perennial; stems 10-50 cm long, solitary or several (up to 5), terete or slightly ribbed, erect, simple or in upper part branched, glabrous; leaves 2-10 cm long, 1-2 cm broad, entire, obtuse or short-acuminate, glabrous; cauline leaves alternate, obovate, rarely oblong-spatulate, gradually narrowed toward base, subsessile or short-petioled; basal leaves rosulate, oblong-spatulate, with petioles 5-20 mm long; flowers in solitary or grouped erect terminal racemes 8-20 cm long, very small, regular, 5-merous, white; pedicels slender, 5-16 mm long, geniculate above the middle, with a small linear-lanceolate or lanceolate acuminate bracteole at the geniculation, glabrous or very faintly glandular-pubescent; calyx, 1.5-3 mm long, campanulate, 5-parted to 1/3 the length (rarely lower down)
 255 into broad ovate acuminate lobes, glabrous; corolla 3-4 mm long, 5-parted, the short tube equaling the calyx, the rotate limb 3-4 mm in diameter; corolla lobes rounded-obovate, obtuse, slightly emarginate; staminoids 5, subulate, alternating with corolla lobes; stamens 5, attached in the tube, opposite the lobes, the filaments short, the large anthers cordate; ovary half-inferior; ovules numerous; fruit a globose or ovoid unilocular many-seeded

* From the Celtic words *san* = healing, and *mos* = pig, as it was used by the Gauls as a remedy for diseases of swine and cattle.

** Arranged by L.A. Smol'yaninova.

capsule, dehiscent with apex by 5 valves; seeds numerous, 0.3-0.4 mm long, brown, angular. Fl. June-July; fr. August-September.

Banks of rivers and seacoasts, humid meadows along streams, and in swampy saline places.—European part: Balt., U. Dnp., M.D., Bl., Crim.; Caucasus: all regions; Soviet Central Asia: T. Sh., Syr-D., Pam.-Al., Mtn. Turkm. **Gen. distr.:** W. Eur. (except in the north), W. and E. Med., Bal.-As. Min., Iran., Ind.-Him., China. Described from W. Europe. Type in London.

Note. In the typical form of *S. Valerandi* L. (var. *typicus* R. Knuth), the stamens are simple or little branched; flowers in racemes, pedicels strongly curved, bracts linear-lanceolate or lanceolate. Knuth regards the species *S. floribundus* H.B.K., distributed through America and Japan, as a variety of *S. Valerandi* L.—var. *floribundus* (H.B.K.) R. Knuth. The stems of this variety are divaricately branched, inflorescence open paniculately-racemose, pedicels more slender and erect, bracts very small narrowly lanceolate or setaceous, the smaller flowers often one half the size of the typical form. Comparison of *S. Valerandi* L. with *S. floribundus* shows, however, that *S. floribundus* H.B.K. differs from *S. Valerandi* L. to an extent justifying its separation as a distinct species.

Tribe 5. LYSIMACHIEAE Rchb. in Mössler, Handb. ed. 1 (1827) 39.—Corolla with a short tube, often rotate; aestivation convolute; capsule dehiscent with valves; ovary superior. Herbs with leafy stems. Leaves opposite, whorled, or spirally arranged.

Genus 1123. **LYSIMACHIA** * L.**

L. Sp. pl. (1753) 146; Endl. Gen. II (1836-1840) 732; Klatt, Gattung *Lysimachia* (1866); Pax in Engl.—Pr. Pflanzenf. IV, 1 (1889) 112.

Calyx deeply 5-parted; corolla hypogynous, subrotate or campanulate, more or less deeply 5-parted, the lobes entire or toothed; stamens 5, shorter than the corolla, attached in the tube at the base of lobes and more
256 or less adnate to corolla; sometimes enlarged at base and there connate into a tube or completely free; anthers oblong, obtuse or sometimes pointed; ovary globose or ovoid; style filiform; stigma capitate; glabrous obtuse; capsule ovoid or globose, with few or many ovules; flowers white or rose or yellow, in a spiciform-racemose or corymbose-paniculate inflorescence or solitary or in whorls of 1 or 2 in the leaf axils. Sprawling or erect plants, with entire, alternate or opposite or verticillate leaves.

Of the 60 species inhabiting the temperate and subtropical zones of the northern hemisphere (few in the southern hemisphere); 11 species occur in the USSR, of these two adventive.

Note. According to Klatt (*Gattung Lysimachia*, p. 4), the presence of glands on the various organs of the plants is so constant that this character may be used for determination of species.

* Name mentioned by Dioscorides, after Lysimachus, king of Thrace.

** Arranged by E.I. Shteinberg.

1. Flowers small, 3-4 mm in diameter, whitish-rose; leaves oblong-lanceolate, acute; inflorescence a long slender terminal raceme. 8. **L. Fortunei** Maxim.
- + Flowers larger, 8-23 mm in diameter 2.
2. Flowers rose, whitish-rose or white 3.
- + Flowers yellow 5.
3. Stem glabrous, leafy nearly from base; upper leaves oblong-lanceolate, short-petioled, acute; lower leaves broadly lanceolate, subacute or obtuse, or orbicular, narrowed into a long petiole; style exceeding the capsule. 7. **L. dubia** Soland.
- + Lower part of the stem commonly leafless 4.
4. Leaves sessile, distinctly pubescent on both sides, up to 1.5 cm broad, ciliate-margined; stem covered with spreading hairs; inflorescence a compact raceme. 6. **L. barystachys** Bge.
- + Leaves narrowed into a petiole, obscurely pubescent, up to 4 cm broad 9. **L. clethroides** Duby.
5. Stems creeping or ascending 6.
- + Stems erect. 8.
6. The plant covered throughout with short hairs; leaves suborbicular, sometimes slightly cordate at base 3. **L. japonica** Thunb.
- + The plant glabrous throughout. 7.
7. Stem decumbent and rooting; leaves ovate-orbicular; calyx lobes ovate-cordate, acute; flowers solitary, axillary 1. **L. nummularia** L.
- 257 + Flowering shoots ascending; leaves ovate, acute; calyx lobes linear-subulate, acute; pedicels reclinate in fruit. 2. **L. nemorum** L.
8. Calyx lobes with a blackish-brown rim; inflorescence a pyramidal panicle. 9.
- + Calyx lobes without a blackish-brown rim; flowers in whorls in the leaf axils 10.
9. Stem and lower part of the leaves covered with somewhat tangled hairs; leaves short-petioled, ovate-lanceolate or ovate, opposite or in whorls of 3 or 4; flowers 20-23 mm across 10. **L. vulgaris** L.
- + Stem glabrous in lower part, the upper part covered with small light-colored glandular hairs, these finally turning dark; leaves broadly or narrowly lanceolate, sessile; flowers 11-15 mm across 11. **L. davurica** Ldb.
10. Leaves mostly acute, borne on a very short petiole or sessile 4. **L. punctata** L.
- + Leaves borne on a long petiole (up to 2 cm and more), obtuse or subobtuse 5. **L. verticillaris** Spreng.

Section 1. **NUMMULARIA** (Gilib.) Klatt, Gattung *Lysimachia* (1866) 7; Gilib. Fl. lithuan. I (1781) 29, pro gen. — Flowers axillary, distinctly pedicellate; corolla with a short tube, the lobes ovate glandular; stamens glandular, dilated and connate at base; style glandular; leaves opposite; stems decumbent.

1. **L. nummularia** L. Sp. pl. (1753) 148; Duby in DC. Prodr. VIII, 66; Ldb. Fl. Ross. III, 28; Pax et Knuth in Engl. Pflanzenr. IV, 237, 258;

Klatt, Gattung *Lysimachia*, 27; Shmal'g. Fl. II, 200; Kryl. Fl. Zap. Sib. IX, 2151; Grossg. Fl. Kavk. III, 212.—*Nummularia repens* Gilib. Fl. lithuan. I (1781) 29.—Ic.: Fl. Dan. III, tab. 493; Rchb. Ic. Fl. Germ. XVII, tab. 1084; Klatt, l.c. tab. 15; Fedch. and Fler. Fl. Evrop. Rossii, 737; Syreishch. Ill. Fl. Mosk. gub. III, 24.—Exs.: GRF, No. 576; Pl. Finland. exs. No. 1276; Hayek, Fl. Stir. exs. No. 465; Billot, Fl. Gall. et Germ. exs. No. 1753 et bis.

Perennial, glabrous throughout; stem up to 30 cm long, slender, trailing and rooting at the nodes; leaves opposite, with petioles 2-5 mm long, ovate-orbicular or rounded-oval, sometimes subcordate, obtuse or acuminate, entire, rather sparsely punctate with small dark glands, 9-25 mm long and 5-20 mm broad; flowers solitary in the axils of the middle leaves; peduncles slightly shorter to slightly longer than the leaves; calyx lobes ovate-triangular, acute, 6-10 mm long, 4-8 mm broad at base; corolla yellow, 258 about twice the length of the calyx, 18-30 mm across, the lobes elliptic, narrowed at both ends, covered on both sides and on the margin with small translucent short-stalked glands, the lobes of corolla and calyx dark-dotted and speckled; corolla lobes 2 1/2 times as long as the stamens; stamens connate merely at base, covered with small glands; fruit a globose capsule, dehiscent with 5 valves. May-August.

Shady woods, inundated meadows, near lakes and in uremas*, steppe depressions.—European part: all regions; Caucasus: Cisc. **Gen. distr.:** Scand., Centr. and Atl. Eur., W. Med., Bal.-As. Min., Japan (adventive), N. Am. Described from W. Europe. Type in London.

Note. Domin (Magyar Botanik. Lapok (1904) 233) distinguishes two varieties according to length of pedicels, each of them subdivided into forms: var. *brevipedunculata* (Opiz) Domin, including the forms f. *ovalifolia* (Opiz) Domin, f. *cordifolia* (Opiz) Domin, f. *rotundifolia* (Opiz) Domin; and var. *longipedunculata* (Opiz) Domin with subvar. *parvifolia* (Opiz) Domin = *L. Zavadskii* Wiesn. and subvar. *rotundifolia* (Schmidt-Opiz) Domin.

Economic importance. Used in earlier times both internally and externally for the treatment of wounds and swellings. The leaves and flowers were also used as a tea substitute. On account of the trailing habit, it was used for decoration of balconies and for carpeting the banks of streams and water courses in gardens. Ornamental value is due to the leaves.

• Section 2. **LEROUXIA** (Mérat) Endl. Gen. (1836-1840) 732, ex pte.; *Lerouxia* Mérat, Nouv. Fl. Paris (1812) 77, pro gen.; Klatt, Gattung *Lysimachia*, 10.—Flowers solitary, axillary, erect; corolla rotate, yellow; filaments of stamens free; fruits cernuous; capsule 5-valved, each valve splitting in two or furnished with 2 or 3 teeth; leaves opposite; glandular pubescence absent.

2. **L. nemorum** L. Sp. pl. (1753) 148; Duby in DC. Prodr. VIII, 66; Ldb. Fl. Ross. III, 1, 28; Klatt, Gattung *Lysimachia*, 40; Shmal'g. Fl. II, 200.—*Lerouxia nemorum* Mérat, Fl. Paris, ed. 2 (1821) 149.—Ic.: Fl. Dan. I, tab. 174; Rchb. Ic. Fl. Germ. XVII, tab. 1084; Klatt, l.c.

* [Urema, a riverain deciduous forest strip.]

tab. 23; Bot. Mag. 60, tab. 3273.— Exs.: Fl. Bohem. et Morav. exs. No. 859; Hayek, Fl. Stir. exs. No. 874; Fl. ital. exs. No. 1910; Billot, Fl. Gall. et Germ. exs. No. 1754.

259 Perennial; glabrous throughout; stems up to 40 cm long, slender, with two flat opposite grooves, decumbent, often branched and the flowering shoots ascending; leaves ovate, 2-2.5 (3.5) cm long, 1-1.5 cm broad, acute or obtuse, opposite, entire, borne on a petiole 2.5 mm long, often black-dotted on the underside; flowers solitary, axillary, yellow; peduncles commonly exceeding the leaves, filiform, reclinate in fruit; calyx parted down to base into linear-subulate acuminate lobes, shorter than the corolla; corolla 8-12 mm across, the lobes ovate-orbicular, obtuse; filaments of stamens shorter than the corolla, attached at the base of corolla lobes, completely free; capsule cernuous, globose, dehiscent with 5 valves, each of these splitting in two or furnished with 2 or 3 teeth; style filiform, equaling the stamens. June-July (Plate XIV, Figure 2).

Spruce and beech woods, in the beech zone, on mountain slopes.— European part: U. Dns. **Gen. distr.:** Scand., Centr. and Atl. Eur., W. and E. Med., Africa. Described from W. Europe. Type in London.

Section 3. **CILICINA** F.W. Klatt, Gattung *Lysimachia* (1866) 34.— Flowers yellow, sepaloid, axillary, erect, short-pedicel; pedicels reclinate; capsule 5-valved; leaves opposite or verticillate; the entire plant, especially the leaves, vested with stiff hairs; calyx, corolla, stamens, and leaves glandular; stamens connate in lower part into a tube.

3. **L. japonica** Thunb. Fl. japon. (1784) 83; Duby in DC. Prodr. VIII, 67; Klatt, Gattung *Lysimachia*, 34; Grossgeim, Opred. rast. Kavk. 599.— *L. debilis* Wall. in Roxb. Fl. ind. II (1832) 25.— Ic.: Klatt, l. c. tab. 19; Somoku-Dzusetsu, ed. Makino (Iconogr. Pl. Nippon) III, tab. 33.

Perennial; roots slender, filiform; stems slender, obscurely 4-angled, decumbent or ascending, simple or slightly branched, leafy, up to 25 cm long, covered with straight spreading or slightly appressed hairs; leaves entire, obtuse or subacuminate, opposite, rounded-ovate or ovate, sometimes somewhat cordate at base, petiolate (the petiole 0.5-1 cm long), 1-2.5 cm long, 1.5-2 cm broad, pubescent, ciliate-margined; flowers yellow, solitary or 1-3 in the axils, short-pedicel, the pedicels shorter than or equaling the calyx, erect in flower, reclinate in fruit; calyx parted nearly down to base into lanceolate acute pubescent lobes, exceeding the corolla lobes; corolla parted to base into lance-ovate or ovate crenate lobes; stamens about half the length of corolla, dilated toward base and connate into a tube; style filiform, about equaling the stamens; capsule pubescent in upper part, shorter than the calyx, dehiscent with 5 ovate valves. May-July (Plate XIV, Figure 3).

As a weed in wet places.— Caucasus: W. Transc. (adventive). **Gen. distr.:** Ind.-Him., Dzu.-Kash., Jap.-Chi. Described from Japan. Type in Uppsala?

260 Section 4. **VERTICILLATAE** R. Knuth in Engl. Pflanzenr. IV, 237 (1905) 266.— All flowers in whorls or few-flowered racemes in the axils of uppermost leaves, forming along leafy terminal raceme.

4. *L. punctata* L. Sp. pl. (1753) 147; Duby in DC. Prodr. VIII, 65; Ldb. Fl. Ross. III, 28; Klatt, Gattung Lysimachia, 22; Boiss. Fl. or. IV, 9; Shmal'g. Fl. II, 199. — *L. quadrifolia* Mill. Gard. Dict. ed. 8 (1768) No. 10, ex p. — Ic.: Rchb. Ic. botan. XI, tab. 1804; Jacq. Fl. austr. IV, tab. 366; Klatt, l.c. tab. 11; Syreishch. Ill. Fl. Mosk. gub. IV, 137. — Exs.: Hayek, Fl. Stir. exs. No. 1022; Fl. Austro-Hung. exs. No. 2018; Pl. Hercegov. exs. No. 264; Fl. Bohem. et Morav. exs. No. 479.

Perennial; rhizome cylindrical, creeping, branched; stem up to 1 m long, erect, weakly branched, 4-angled or ribbed, glandular-villous; leaves up to 7 cm long and up to 35 cm broad, broadly lanceolate or cordate-ovate, narrowed toward base, acuminate, entire, black-dotted at the margin on lower side, ciliate, sessile or borne on a very short petiole, gathered in whorls of 3-5, commonly 4, arranged crosswise on the stem, rarely opposite, especially on the lower part of the stem, or alternate, covered above with short appressed hairs, on the underside with more numerous straight spreading hairs, especially on the veins, or softly pubescent; pedicels as long as or longer than the flowers; flowers in axillary whorls, not exceeding the leaves or in the lower whorls the individual flowers replaced by few-flowered racemes equaling or exceeding the leaves; bracts wanting; calyx segment linear-lanceolate, acuminate, covered with spreading hairs, ciliate-margined, half as long as the corolla; corolla lobes ovate, acute, glandular-ciliate, lemon-yellow, orange at base; stamens half the length of corolla; filaments glandular, dilated at base and connate to the middle into a tube surrounding the ovary; style filiform, with capitate stigma equaling the stamens; capsule shorter than the calyx, 4 mm long; seeds trigonous, blackish. June-August.

Humid meadows, shores, and damp woods. — European part: Balt. 263 (Kaliningrad Region), U. Dns., M.D., Bes. **Gen. distr.:** Centr. Eur. (Austria, Hungary), Atl. Eur., W. Med., Bal.-As. Min. (Greece). Described from Holland. Type in London.

5. *L. verticillaris* Spreng. Fl. Hal. Mant. (1807) 36. — *L. verticillata* M.B. Fl. taur.-cauc. I (1808) 141. — *L. punctata* var. β *verticillata* (M.B.) Boiss. Fl. or. IV (1879) 9; Kuzn. in Mat. Fl. Kavk. IV, 1, 151; Grossg. Fl. Kavk. III, 212. — Ic.: Rchb. Ic. botan. XVII, tab. 1805.

Perennial; leaves ovate-oblong, subobtuse, softly pubescent beneath; the petioles 1-2 cm long; half-whorls axillary, many-flowered; pedicels elongating in fruit; otherwise resembling *L. punctata* L. July-August.

Wet places, among shrubs. — European part: L. Don, Crim.; Caucasus: all regions. **Gen. distr.:** As. Min., Iran. Described from the Crimea. Type in Berlin.

Note. N.I. Kuznetsov (Mat. Fl. Kavk., IV, 1, 151) carried out a detailed investigation to determine whether the form occurring in the Caucasus is *L. punctata* or its variety var. *verticillata* (M.B.) Boiss. (= *L. verticillaris* Spreng.). As a result of an elaborate study of all available material, he arrived at the conclusion that the typical West European species *L. punctata* L. does not occur in the Caucasus.

Section 5. **EPHEMERUM** (Rchb.) Endl. Gen. (1836-1840) 732; *Ephemerum* Rchb. Fl. Germ. exc. (1830) 409, pro gen.; Duby in DC. Prodr.



Plate XIV

1. *Lysimachia barystachys* Bge., general view, leaf fragment showing the dense vestiture of the upper surface, capsule, open corolla, style.
2. *L. nemorum* L., general view, calyx, flower, capsule.
3. *L. japonica* Thunb., general view, stamens connate at base, petal, capsule.

VIII, 61; Klatt, Gattung *Lysimachia*, 5. — Inflorescence a many-flowered terminal raceme; flowers white, rose, or purplish-red; stamens attached at the base of corolla lobes and more or less adnate to corolla; glands on leaves, bracts, calyces, and petals, numerous, commonly red, turning dark in drying; capsule dehiscent with 5 valves; leaves alternate or opposite.

Subsection 1. *SPICATAE* R. Knuth in Engl. Pflanzenr. IV, 237 (1905) 285. — Flowers always numerous, in a spiciform terminal raceme; lateral racemes often present; stem simple or nearly so, erect.

6. *L. barystachys* Bge. in Mem. Acad. Sc. Petersb. II (1835) 127; Dubyin DC. Prodr. VIII, 61; Rgl. Tent. Fl. ussur. (1861) 11; Pax et Knuth in Engl. Pflanzenr. IV, 237, 289; Kom. in Alis. Opred. rast. Dal'nevost. kr. II, 853. — Ic.: Rgl. l. c. tab. 9, fig. 1-3. — Exs.: Karo, Plant. Amur. et Zeaënsae, No. 214.

Perennial; rhizomes slender, creeping, branched, stoloniferous; stem erect, simple or in upper part branched, covered with spreading articulate
264 translucent hairs, in lower part sometimes glabrous, 30-60 cm long; leaves alternate, rarely opposite, linear-oblong to lance-oblong, 5-8 cm long, 0.5-1.5 cm broad, acuminate, narrowed toward base, entire, sessile, pubescent on both sides, more densely so beneath, the margin ciliate, not punctate; inflorescence a spiciform terminal compact raceme, initially reclinate, becoming erect; bracts linear, mucronate, ciliate; pedicels pubescent; calyx campanulate, deeply cleft into ovate segments, the membranous margin with glands; corolla white, about 3 times the length of the calyx, the lobes oblong-lanceolate obtuse; corolla tube short; stamens half as long as the corolla lobes, the glandular filaments gradually enlarged toward base; style subcapitate; capsule 3-3.5 mm in diameter, with persistent style; seeds black, trigonous, with reticulate surface. June-August (Plate XIV, Figure 1).

Inundated and mountain meadows, in sandy or clayey soil; more rarely on mountain slopes, exposed or among shrubs. — Far East: Ze.-Bu., Uss. **Gen. distr.:** China, Japan, Mongolia, Korea. Described from the vicinity of Peking. Type in Leningrad.

7. *L. dubia* Soland. in Ait. Hort. Kew, I (1789) 199; Ldb. Fl. Ross. III, 26; Klatt, Gattung *Lysimachia*, 12; Rgl. in Izv. Obshch. lyubit. estestv., antrop. i etnogr. XXI, Ed. 2, 21; Boiss. Fl. or. IV, 8; Shmal'g. Fl. II, 199; Kuzn. in Mat. Fl. Kavk. IV, 1, 146; Pax et Knuth in Engl. Pflanzenr. IV, 237, 289; Fedch. and Fler. Fl. Evrop. Rossii, 738. — Ic.: Klatt, l. c. tab. 2. — Exs.: HFAM, No. 152.

Annual or biennial; rhizome fibrous; plants glabrous throughout, densely leafy, 30-70 cm long, in upper and middle part branched or simple, in lower part slightly violet, the branches opposite or alternate, 9-20 cm long, leafy; leaves 4-7 cm long, alternate or nearly opposite, entire, lanceolate to lance-linear, acute, the lower ones often broadly spatulate and obtuse, gradually narrowed at base into the petiole, this 5-25 mm long; inflorescence a spiciform raceme terminating both the main stem and the branches; pedicels approximately equaling the calyx; bracts linear-subulate, acute, as long as the flowering pedicels; calyx campanulate, the segments linear-lanceolate, ca. 3 mm long, white-rimmed, ciliate on the margin, the

surface studded with glands and red finally darkening speckles; corolla rose, twice the length of the calyx, the obovate obtuse lobes glandular in lower part; stamens attached at base of and shorter than the corolla, the filaments glandular; capsule 3-3.5 mm in diameter, globose, with a persistent filiform style; seeds black, 4-angled. July-August.

- 265 Ditches, humid meadows, and shore pebbles. — European part: Crim. (Besser's herbarium, according to data in the literature); Caucasus: all regions; Soviet Central Asia: Pam.-Al., T.Sh. (W.). **Gen. distr.:** Bal.-As. Min., Iran. Described from cultivated specimens. Type in London.

Note. 1) According to Boissier and Schmalhausen, *L. dubia* is an annual; Kuznetsov, and Fedchenko and Flerov described it as biennial. A.I. Vvedenskii maintains that, at least in the southern part of Soviet Central Asia, *L. dubia* occurs as a biennial plant.

2) Regel distinguishes two forms, according to the length of bracts: α . *typica*, with bracts as long as pedicels, calyx half the length of corolla; and β . *longibracteata*, with bracts equaling or exceeding the calyx and corolla and half as long again as the calyx; the first form grows, according to Regel, in the southern part of the USSR and in the Caucasus, the second was found by O. A. Fedchenko in the vicinity of Samarkand. A.I. Vvedenskii (exs. HFAM, No. 152) assumes that these forms can be regarded as geographical races.

8. ***L. Fortunei*** Maxim. in Bull. Acad. Sc. Petersb. XII, (1868) 68; Pax et Knuth in Engl. Pflanzenr. IV, 237, 290; Grossg. Fl. Kavk. III, 212. — *L. barystachys* Klatt in Gattung *Lysimachia* (1866) 11, non Bge. — Ic.: Somokou-Dzusetzu, ed. Makino, III, 62.

Perennial, with creeping root; stems 30-50 cm long, erect, in upper part sometimes branched, in lower part sulcate and often leafless, reddish-brown, glabrous or in inflorescence slightly pubescent; leaves alternate, narrowly or broadly lanceolate, acute (the lower ones sometimes obtuse), coriaceous, subsessile or narrowed into a short petiole, entire, glabrous, black-dotted, 3-6 cm long, 1-1.5 cm broad; inflorescence a loosely many-flowered terminal raceme, elongating in fruit; flowers small, 3-4 mm in diameter, white -rose; bracts lance-subulate, equaling or exceeding the pedicels; calyx segments ca. 2 mm long, 1 mm broad, oval, obtuse, white-rimmed, glandular on the margin, half as long as corolla; corolla lobes broadly obovate, round-tipped, ca. 3.5 mm long; 2.5 mm broad, more than twice as long as the stamens; filaments of stamens 0.5 mm long, dilated at base, attached at base of corolla, connate at the enlarged base into a tube fused with corolla; style thickened, glandular at base, barely exceeding the globose ovary; style truncate; seeds black, trigonous, 0.75 mm long, 0.5 mm broad. July-September.

A weed in tea plantations. — Caucasus: W. Transc. (advent.). **Gen. distr.:** Japan, China. Described from Japan (Nambu, on Nippon Island). Type in Leningrad.

- 266 9. ***L. clethroides*** Duby in DC. Prodr. VIII (1844) 61; Klatt, Gattung *Lysimachia*, 13; Pax u. Knuth in Engl. Pflanzenr. IV, 237, 290; Kom. in Alis. Opred. rast. Dal'nevost. kr. II, 853. — *L. ephemereum* Thunb. Fl. Japon, (1784) 83. — Ic.: Klatt, l.c. tab. 3; Somokou-Dzusetzu, ed. Makino, III, 3, tab. LXI.

Perennial; stems leafy, simple, erect, glabrous, sulcate, up to 60 cm long; leaves alternate, entire, ovate-lanceolate, acuminate (var. *typica* R. Knuth), narrowed into a short petiole, glaucescent beneath, slightly pubescent to glabrate on both sides, sometimes more distinctly pubescent (var. *pubescent* Maxim.), revolute in drying, up to 11 cm long, up to 4 cm broad, the surface black-dotted; inflorescence a spiciform loose terminal raceme; pedicels sparsely glandular-puberulous or covered with longer simple hairs, in fruit half as long again to twice as long as the bracts, in flower shorter than or equaling the bracts; bracts linear-subulate, acute, sparsely ciliate-margined; calyx about one-third the length of corolla, campanulate, deeply parted into ovate segments, subacuminate, blackish, the white membranous margin with small glands; corolla white, the tube not exceeding about 1.5 mm, the lobes ovate-lanceolate obtuse; stamens half as long as corolla, attached to the tube opposite the lobes; anthers large, acute; ovary oblong-ovoid; style subclavate; stigma flattened-globose, notched. July-August.

Mountain forests, dry meadows, and dry meadow slopes. — Far East: Uss. **Gen. distr.:** China, Japan. Described from Japan. Type in Geneva.

Section 6. **LYSIMASTRUM** Endl. Gen. II (1836-1840) 732; Klatt, Gattung *Lysimachia*, 6. — Flowers yellow; corolla with a short tube; filaments of stamens dilated at base and connate into a tube enclosing the ovary; corolla lobes entire; stamens, calyx segments, leaves, style, and ovary, more or less glandular; leaves opposite or verticillate; capsule 5-valved.

10. **L. vulgaris** L. Sp. pl. (1753) 146; Duby in DC. Prodr. VIII, 65; Ldb. Fl. Ross. III, 27; Klatt, Gattung, *Lysimachia*, 21; Shmal'g. Fl. II, 199; Grossg. Fl. Kavk. III, 212; Kryl. Fl. Zap. Sib. IX, 2150. — Ic.: Rchb. Ic. Fl. Germ. XVII, tab. 1086; Klatt, l.c. tab. 9; Fedch. and Fler. Fl. Evrop. Rossii, 738; Syreishch. Ill. Fl. Mosk. gub. III, 24. — Exs.: GRF, No. 929; Fl. cauc. exs. No. 190; Pl. Finland. exs. No. 848a, 849 and 929; Billot, Fl. Gall. et Germ. exs. No. 1928; Pl. Hung. exs. No. 250; Fl. Bohem. et Morav. exs. No. 860.

267 Perennial, creeping with rhizome and long stolons; stem 60-120 cm long, erect, bluntly 4-angled, covered with soft slightly tangled hairs, more densely so in upper part, the leaves in lower part of the stem replaced by brown scales; leaves 5-10 cm long, 1-5 cm broad, oblong-lanceolate to ovate-lanceolate, with petioles up to 3 mm long, opposite or in whorls of 3 or 4, entire, acuminate, glaucescent and villous-pubescent beneath, glabrate and dotted above; pedicels short, not longer than the flowers; flowers in the axils of sublinear terminal bracts, gathered in small racemes forming together a rather dense pyramidal terminal racemose inflorescence; corolla lobes lanceolate to ovate-lanceolate, long-acuminate, the margin with reddish-brown rim and ciliate; corolla bright yellow, 20-23 mm in diameter, with a very short tube; corolla lobes up to 10 mm long, 0.5 mm broad, oblong-ovate or elliptic, obtusish, smooth on the margin, the inner surface covered with short glands; stamens equaling the style, half the length of corolla, the glandular filaments dilated at base and connate into a tube enclosing the ovary; capsule with persistent style. June-August.

Ditches, damp forest margins, damp coppices, inundated meadows; banks of rivers, lakes and oxbow lakes. — European part: all regions; Caucasus: Cisc.; Dag., W., E., and S. Transc.; W. Siberia: all regions; E. Siberia: Yenisei; Ang.-Say., Lena-Kol.; Soviet Central Asia: Ar.-Casp., Balkh., Syr. D., Pam.-Al., T. Sh. **Gen. distr.:** Scand, Centr. and Atl. Eur., Med. except S. Turkey and Greece, Dzu.-Kash. Described from W. Europe. Type in London.

Note. Herbarium specimens relating to Ang.-Say. and Dau. regions, represent in their vesture a transitional stage between *L. vulgaris* L. and *L. davurica* Ldb., being a mixture of glandular and simple hairs.

Economic importance. Leaves and flowers (*Herba et Flores Lysimachiae luteae*) were used in popular medicine. The herbage has tinctorial properties. Depending on mordants, water extracts give a yellow, green, or, upon addition of iron, brown and black color. The roots produce a brown dye. Owing to the content of saponins, especially in the roots, the plants are not eaten by animals.

11. *L. davurica* Ldb. in Mem. Acad. Sc. Petersb. V (1814) 523; Fl. Ross. III, 27; Turcz. Fl. baic.-dah. II, 240; Klatt, Gattung *Lysimachia*, 21. — *L. vulgaris* β . *davurica* (Ldb.) R. Knuth ex Pax et Knuth in Engl. Pflanzenr. IV, 237 (1905) 304. — *L. davurica* f. *latifolia* Hara in Bot. Mag. Tokyo, L. (1936) 568. — Ic.: Ldb. Ic. pl. fl. Ross. tab. 214; Klatt, l. c. tab. 7. — Exs.: Karo, Pl. Amur. et Zeaënsae, No. 199.

- 268 Perennial; rhizome slender, creeping, with reddish underground offshoots, bearing paired membranous acutely lanceolate scales; stem erect, simple, up to 80 cm long, often branched only in the inflorescence, the lower part glabrous, the upper part covered with small light-colored finally ferruginous glandular hairs; leaves on the lower part of the stem alternate, on the middle and upper part opposite or in whorls of 3-5, all sessile, narrowly linear (f. *angustifolia* Freyn in sched.), elongate-lanceolate or lanceolate or broadly lanceolate, up to 11 cm long and 2-3 cm broad (f. *latifolia* Hara), glabrous and profusely black-dotted; inflorescence a strongly branched leafy terminal panicle, the branches and pedicels glandular-puberulous; bracts subulate, glandular-margined; pedicels equaling or exceeding the ovary; calyx with a distinct tube, the segments triangular, finely pointed, rimmed dark red and glandular-margined; corolla yellow, twice the length of the calyx, with an inconspicuous tube, 11-15 mm in diameter; corolla lobes lanceolate, narrowed toward base, obtusish, glandular on the inner side, red-punctulate on the nerves, up to 7 mm long and up to 3-4 mm broad; stamens half the length of corolla, the glandular filaments connate at base into a tube surrounding the ovary; capsule globose, with a slender persistent style. July-August.

Inundated and mountain meadows, scrub, sedge and hypnum bogs. — E. Siberia: Lena-Kol., Ang.-Say., Dau.; Far East: Ze.-Bu., Uda, Uss., Sakh. **Gen. distr.:** Mongolia, China, Japan. Described from Dauria. Type in Leningrad.

Genus 1124. **NAUMBURGIA*** MOENCH**

Moench, Meth. Suppl. (1802) 23; Pax in Engl.—Pr. Pflanzenf. IV, 1 (1889) 113.—*Thyrsanthus* Schrank in Denkschr. Akad. München, 1813 (1814) 75.—*Nummularia* O. Ktze. Rev. Gen. II (1891) 398, p. p.

Lobes of calyx and corolla and stamens 6 or 7, rarely 5; calyx and corolla campanulate, cleft nearly to base into narrow lobes; small teeth often present between the corolla lobes; stamens glabrous, not connate in lower part; fruit a globose many-seeded capsule, dehiscing with base by valves. Herbs with opposite leaves and dense racemes; flowers yellow, dotted reddish-brown, pedicellate, in the axils of uppermost leaves.

Naumburgia thyrsiflora (L.) Rchb. has been found in the Lower Pliocene of V. -Kama (Yumaguzinskaya), in the Middle Pliocene of V. -Don (Krivobor'e), and in interglacial layers of V. -Kama (Galich)

- 269 1. **N. thyrsiflora** (L.) Rchb. Fl. germ. exc. (1830) 410; Duby in DC. Prodr. VIII, 60; Ldb. Fl. Ross. III, 25; Kryl. Fl. Zap. Sib. IX, 2148.—*Lysimachia thyrsiflora* L. Sp. pl. (1753) 147; Klatt, Gattung *Lysimachia*, 42; Shmal'g. Fl. II, 199.—*Nummularia thyrsiflora* O. Ktze. Rev. Gen. II (1891) 358.—*Naumburgia guttata* Moench, Meth. Suppl. (1802) 23.—Ic.: Rchb. Ic. Fl. Germ. XVII, 28, tab. 44, f. II; Klatt. l. c. tab. 24; Syreishch. Ill. Fl. Mosk. gub. III, 23; Hegi, Fl. V, 3, tab. 212.—Exs.: GRF, No. 70; Pl. Finland. exs. No. 319; K. Regel, Fl. lithuan. exs. No. 72; Fl. pol. exs. No. 240; Fl. exs. Reipubl. Bohem. Sloven. No. 1254; Fl. exs. Austro-Hung. No. 2107; Schultz, Herb. norm. No. 2041; Fl. Gall. et Germ. exs. No. 918.

Perennial; rootstock long, creeping, stoloniferous; stem erect, 25-60 cm long, glabrous or sparsely covered, especially at the nodes, with long tangled ferruginous hairs; leaves sessile, opposite, rarely verticillate, lanceolate, long-acuminate, entire, dark-punctulate, often covered beneath with long tangled ferruginous hairs, 5-10 cm long, 0.5-2.5 cm broad; leaves on the lower part of the stem replaced by membranous brownish scales; racemes 1.5-3 cm long, the length of peduncles, together with peduncles 2-4 times as long as the leaves; pedicels shorter than the flowers, subtended by linear acuminate bracteoles, these half as long as the pedicels; calyx segments lance-linear, acute, ca. 2-2.5 mm long, 0.75 mm broad; corolla lobes linear, obtusish, 5-6 mm long, 0.5 mm broad; filaments of stamens equaling or exceeding the corolla, adnate only to tube and slightly shorter than the style. May-July.

Shallow water, bogs, inundated meadows; banks of rivers, lakes and oxbow lakes.—Arctic: Arc. Sib., Chuk.; European part: Kar.-Lap., Dv.-Pech., Lad.-Ilm., Balt., V. -Kama, U. Dnp.; W. Siberia: all regions; E. Siberia: all regions; Far East: Kamch., Ze.-Bu., Uda, Uss., Sakh. (and Kurile Is.); Soviet Central Asia: Balkh. **Gen. distr.:** Scand., Centr. and Atl. Eur., Mong., China, N. Am. Described from W. Europe. Type in London.

* Named after Johann Samuel Naumburg, author of a textbook of botany (Hamburg and Altona), 1798.

** Arranged by E. I. Shteinberg.

L. Sp. pl. (1753) 344.—*Lysimachia* sect. *Trientalis* Klatt in Linnaea, XXXVII (1871-1873) 499.

Flowers borne on long slender pedicels, axillary; calyx and corolla 7 (rarely 5 or 9) parted nearly to base; corolla flat, rotate, white; stamens 270 7 (rarely 5 or 9); filaments long, slender, united at base into a hyaline ring; anthers linear, obtuse; pistil with a globose ovary, filiform style, and obtuse stigma; fruit a globose capsule dehiscing with 5 valves; seeds small, flattish, the surface reticulate. Perennial herbs with erect stems; cauline leaves numerous, alternate; terminal leaves larger, verticillate, oblong-obovate and short-acuminate.

Of the four species distributed through Europe, Asia and NW America. 2 occur in the USSR.

1. Cauline leaves 1-3, small; pedicels glabrous or in upper part rarely glandular-pubescent 1. **T. europaea** L.
- + Cauline leaves 5-8 (9); pedicels always glandular-pubescent in upper part 2. **T. arctica** Fisch.

1. **T. europaea** L. Sp. pl. (1753) 344; Duby in DC. Prodr. VIII, 59; Ldb. Fl. Ross. III, 1, 24; Turcz. Fl. baic.-dahur. II, 238; Shmal'g. Fl. II, 200; Kom. Fl. Man'chzh. III, 239; Fl. Kamch. III, 28; Kom. and Alis. Oprod. rast. Dal'nevost. kr. II, 853; Kryl. Fl. Zap. Sib. IX, 2147.—*T. alsinaeflora* Gilib. Fl. lithuan. I (1781) 31.—*T. europaea* var. *a. eurasiatica* R. Knuth in Engl. Pflanzenr. IV, 237 (1905) 313.—*T. europaea* var. *genuina* Trautv. et Mey. Fl. Ochot. (1856) 67.—*T. europaea* var. *arcticaeformis* Iljinski in Zhurn. Bot. obshch. 6 (1921) 50.—*T. europaea* var. *ramosa* Iljinski, l.c. 52.—*Lysimachia trientalis* Klatt in Linnaea, XXXVI (1871) 499.—Ic.: Fedch. and Fler. Fl. Evrop. Rossii, Fig. 623; Syreishch. Ill. Fl. Mosk. gub. III, 22; Kom. and Alis. l.c. Plate 2592; Fl. Yugo-Vost. VI, Fig. 562.—Exs.: GRF, Nos. 374, 2175 and 2176; Herb. Fl. Reip. Sow. Ucr. No. 83; Fl. pol. exs. No. 242, a and b and No. 246; Pl. Finland. exs. No. 847.

Perennial, (5) 7-15 (20) cm tall, glabrate; rootstock very slender, 1.5-2 mm in diameter, brown, the numerous long slender stolons terminating in tuberlike structures; stems glabrous or more or less glandular-pubescent in upper part, slender, erect, simple; lower leaves 1-3 or none, small, 3-7 mm long, 1-2 mm broad, squamaceous, the middle ones 1-1.5 cm long, 0.5-0.8 cm broad; all obovate or oboval or elliptic, obtuse; terminal leaves large, 2-6.5 (7) cm long, 1-2.5 cm broad, in a terminal whorl or rosette, unequal, oblong-elliptic or broadly lanceolate, short-acuminate, cuneately narrowed at base into a petiole 271 1-3 mm long, entire, sometimes in apical part dentate; flowers mostly solitary or 2-4; pedicels 3.5-5 cm long, slender, filiform, glabrous, more or less glandular in upper part, in the axils of the terminal leaves, equaling or exceeding these or rarely shorter; calyx mostly 7-parted, rarely 5- or 9-parted, 4 mm long, about half the length of corolla; calyx segments lance-linear to linear, 3.5 mm long, 0.5-0.7 mm broad, acute, spreading after anthesis; corolla snow-white, rotate, 7-parted or rarely 5-

* From Latin *triens* = one-third, the peduncles being one-third the length of the stem.

** Arranged by S.G. Gorshkova.

or 9-parted nearly to base, 7.5-8.5 mm long, 1.3-1.8 mm in diameter; corolla lobes oval or elliptic, pointed, 7-7.5 (8) mm long, 5 mm broad, or 2.5 mm broad (var. *angusta* H. Lindb.); stamens 7, rarely 5 or 9; anthers orange, rounded-ellipsoid; ovary 0.7-1 mm in diameter; style 3.5-5 mm long, 5 times as long as ovary; stigma capitate; capsule unilocular, many-seeded, 3 mm in diameter, dehiscing with 5 recurved valves; seeds subovoid, small, 1 mm in diameter, the surface reticulate. May-August.

In woods of the forest zone, rarely in the polar-arctic zone and in the lower part of the alpine zone.—Arctic: Arc. Eur., Nov. Z., Arc. Sib.; European part: Kar.-Lap., Dv.-Pech., Balt., Lad-Ilm., U.V., V.-Kama, U. Dnp., M.D., V.-Don, U. Dns., Crim., L. Don; W. Siberia: Ob, U. Tob., Alt.; E. Siberia: all regions; Far East: Kamch., Okh., Ze.-Bu., Uda, Uss., Sakh. **Gen. distr.:** Arc., Scand., Centr. and Atl. Eur., Mong., Jap.-Chi., Ber., N. Am. Described from N. Europe. Type in London.

2. **T. arctica** Fisch. ex Hook. Fl. bor. Amer. II (1840) 15; Kom. Fl. Man'chzh. III, 240.—*T. europaea* Cham. et Schlecht. in Linnaea, I (1826) 224, non L.; *T. europaea* β . *arctica* (Fisch.) Ldb. Fl. Ross. III, 1 (1847-1849) 25; Kom. Fl. Kamch. III, 28; Sugawara, Ill. Fl. or Saghal. IV, 1531.—*T. europaea* subsp. *arctica* (Fisch.) Hult. Fl. Kamtsch. IV (1930) 56.— **Ic.:** Engl. Pflanzenr. IV, 237, 315, f. 66, D.

Perennial, 7-20 (25) cm tall, glabrous except for the terminal part of the stem and the pedicels, these being sparsely covered with rounded brown short-stalked glandular hairs; rootstock slender, 1.5-2 mm in diameter, spreading by long filiform stolons; stem erect, simple, slender, leafy; cauline leaves 5-7 (9), obovate-cuneate, obtuse, the lower 1-3 distant, squamaceous, 3-7 mm long and 1-3 mm broad, the middle ones larger, (1) 2.5-4 cm long and 0.7-2 cm broad, the terminal ones approximate in a whorl, unequal, oblong-obovate, 2-5 cm long, 1-3.5 cm broad; all leaves 272 cuneately narrowed at base, subsessile or with pedicels 1-2 mm long, entire, subacute; flowers mostly solitary, rarely 2 (3); pedicels 1.5-3.5 cm long, subfiliform, glandular, in the axils of terminal leaves, and mostly shorter than or rarely equaling them; calyx mostly 7-parted, rarely 5- or 9-parted, 4.5 mm long, two-thirds the length of corolla; calyx segments linear, 4 mm long and 0.7-1 mm broad, acute, spreading after anthesis; corolla white, 6.5-7 mm long, rotate, mostly 7-parted, rarely 5- or 9-parted; corolla lobes obovate or lanceolate, 6-6.5 mm long, 3-4 (5) mm broad, pointed; stamens 7, rarely 5 or 9, with ellipsoid orange anthers; ovary globose, 0.7-1 mm long; style 3.5-4 mm long, about equaling the stamens and 4-5 times the length of ovary; capsule globose, 3 mm in diameter, glabrous, unilocular, many-seeded, dehiscing with 5 recurved valves; seeds small, 1 mm in diameter, flattish, the surface reticulate. June-August.

Humid tundra, meadow-peat bogs, meadows, coppices, mixed and birch woods, exposed mountain glades. Arctic: Chuk., An.; E. Siberia: Ang.-Say., Dau.; Far East: Kamch., Okh., Sakh. (and Kurile Is.). **Gen. distr.:** Japan, N. America. Described from Kamchatka and Unalaska. Type in Leningrad.

Flowers regular, small, solitary, short-pedicelled, axillary; calyx persistent, 5-parted to base into subulate-lanceolate aristate-tipped reflexed segments; corolla small, a quarter to one-third the length of calyx, persistent in fruit, with a short tube and a rotate-campanulate 5-parted limb; stamens 5, attached at corolla base, the filiform filaments exceeding the corolla and shorter than the calyx, the anthers cordate; pistil with globose ovary, filiform style, and a small capitate stigma; capsule globose, 5-valved, 2-3 seeded; seeds small, subglobose. Small annual plants, branched at base, spreading; leaves opposite, sessile, linear or ovate.

A genus represented by two species distributed through the Mediterranean area and Abyssinia.

1. **A. linum-stellatum** (L.) Hoffmsg. et Link, Fl. Portug. I (1809) 333; Ldb. Fl. Ross. III, 1, 29; Boiss. Fl. or. IV, 10; Kuzn. in Mat. Fl. Kavk. IV, 1, 157; Grossg. Fl. Kavk. III, 213.—*Lysimachia Linum-stellatum* L. Sp. pl. (1753) 211.—Ic.: Fedch. and Fler. Fl. Evrop. Rossii, 739, Fig. 624.—Exs.: GRF, No. 1783.

- 273 Annual, 1-2 (5-10) cm tall; stem slender, erect, simple or many-branched from base, the branches filiform, leafy; leaves small, 5-6.5 cm long, (1) 1.4-1.7 cm broad, subhyaline, opposite, oblong-lanceolate to short-lanceolate, sessile, acute, more or less roughened on the margin; flowers solitary; pedicels 1.5-2 mm long, axillary, one-third the length of leaves and shorter than calyx, half-nodding or arched-recurved; calyx 5-parted nearly to base, 2-2.5 (3) mm long, 3-4 times the length of corolla; calyx segments linear-lanceolate, 1.5-2 (2.7) mm long, 0.5-0.7 mm broad, stellate, awn-tipped, acuminate, spreading after anthesis; corolla whitish, 0.6-0.7 mm long, with ovoid tube 0.2 mm long and deeply 5-parted rotate-campanulate limb, the broadly obovate erose-denticulate or short-acuminate lobes 0.5 mm broad; stamens 5; filaments 0.2 mm long, attached at the base of and shorter than corolla lobes; anthers cordate, bilocular; ovary 0.2 mm long, 0.2 mm broad; style straight, 0.3 mm long, slightly exceeding the stamens; stigma small, capitate; capsule globose, 1.5-2 (2.5) mm long, about one quarter shorter than the calyx, yellowish, smooth, 5-parted nearly to base, few-seeded; seeds small, 1.2 mm long, 0.7-1 mm broad, ovaloid or sometimes globose, dark brown, at face more or less flattened with a concave center and 5-8 radiating ribs passing over to the convex back. March-April.

Dry slopes, mounds, and stony places.—European part: Crim. (Simeiz); Caucasus: E. Transc. **Gen. distr.:** Med., Bal.-As. Min., Iran., N. Africa. Described from Portugal. Type in Berlin.

Note. Very rare in the USSR, occurring only in the SW part of E. Transcaucasia, where it was first collected in 1829 by Sovich near Sakh-Bulaga, and in S. Crimea in the vicinity of Simeiz, where it was first discovered in 1902 by V. A. Transhel.

* From Greek aster = star, and linon = flax, referring to the rotate corolla limb and the leaves resembling those of flax.

** Arranged by S. G. Gorshkova.

Tribe 6. **GLAUCEAE** Fed. in Addenda XVII, 732. — Corolla wanting; calyx corollaceous, colored; capsule dehiscent with valves; ovary superior; flowers subsessile, in the axils of somewhat fleshy leaves; stem branched.

Genus 1127. **GLAUX*** L. **

L. Sp. pl. (1763) 207.

Flowers solitary, short-pedicelled or subsessile, axillary; corolla: none;
274 calyx colored, rose or white, petaloid, campanulate, 5-parted to about the middle; stamens 5, hypogynous, attached at base of calyx between its segments, the filaments equaling the calyx, the cordate-ovate anthers dorsifixed; pistil with a globose glandular ovary; filiform style, and capitate stigma; capsule globose to ovoid-globose, 5-valved, many-seeded; seeds subtrigonal-oblong; leaves decussate.

Genus represented by a single species, widely distributed through the temperate and subarctic lands of the northern hemisphere.

1. **G. maritima** L. Sp. pl. (1753) 207; M.B. Fl. taur.-cauc. I, 175; Ldb. Fl. alt. I, 274; Ldb. Fl. Ross. III, 1, 23; Turcz. Fl. baic.-dah. II, 237; Boiss. Fl. or. IV, 7; Shmal'g. Fl. II, 201; Kuzn. in Mat. Fl. Kavk. IV, 1, 158; Kom. Fl. Man'chzh. III, 240; Kom. and Alis. Oprod. rast. Dal'nevost. kr. II, 853; Grossg. Fl. Kavk. III, 213; Kryl. Fl. Zap. Sib. IX, 2146. — Ic.: Fedch. and Fler. Fl. Evrop. Rossii, Fig. 625; Fl. Yugo-Vost. VI, Fig. 563. — Exs.: GRF, No. 518; Pl. Finland. exs. No. 850; Herb. Fl. Ingr. No. 419; HFAM, No. 440; Herb. Fl. Cauc. No. 283.

Perennial, 4-25 (30) cm tall, cinerous, glabrous; rootstock 2 mm thick, clothed in brown ovate scales, spreading by creeping stolons; stem simple or branched from base, with prostrate or erect or ascending densely leafy branches; leaves thickish, almost fleshy, (0.4) 0.5-1.5 cm long, (1.5) 2-4.5 mm broad, lanceolate or ovate-lanceolate or oblong-lanceolate, and acute or elliptic and obtuse (var. *obtusifolia* Fern.), all entire, sessile, minutely pitted on both sides, the pits mostly brown; flowers solitary, on pedicels 0.3-0.7 (1) mm long or sometimes subsessile, axillary; calyx pale rose or reddish (var. *rubella* Nees) or almost white (var. *alba* Nees), 3-5 mm long, 2 mm broad, 5-parted, corollaceous, the ovate round-tipped lobes 2 mm long and 1.5-2 mm broad; stamens 5; filaments glabrous, 2.5 mm long, sometimes shorter (var. *rubella* Nees) or equaling (var. *alba* Nees) the calyx; ovary ovoid, globose, or ovaloid, 1.3-1.5 (2) mm long, 1-1.7 mm broad, brown, glandular, unilocular; style filiform, 2.7-3 mm long, approximately equaling the stamens; stigma capitate; capsule globose or globose-ovoid, 3 mm long, acuminate, smooth, dull, brown, unilocular, few-seeded, 5-valved; seeds oblong, ellipsoid or ovaloid, 1 mm long, 0.8 mm broad, plano-convex, subtrigonal, almost black, finely tuberculate. May-June.

275 Shores, bog margins, salt marshes, muddy shallows, and gullies; rising in mountains to 2900 m. — European part: Kar.-Lap., Dv.-Pech., Balt., Lad.-Ilm., U.V., V.-Kama, M.D., V.-Don, Transv., U. Dns., Bl., Crim., L. Don, L.V.; Caucasus: Cisc., W., E., and S. Transc.,

* Name mentioned by Dioscorides; the Greek word "glaux" refers to some related plant; from Greek *glaucos* = grayish-green.

** Arranged by S.G. Gorshkova.

Tal.; W. Siberia: all regions; E. Siberia: Lena-Kol., Ang.-Say., Dau.; Far East: Uda, Uss., Sakh. (and Kurile Is.); Soviet Central Asia: Ar.-Casp., Balkh., Mtn. Turkm., Syr D., Pam.-Al. **Gen. distr.:** Scand., Centr. and Atl. Eur., Bal.-As. Min., Iran., Ind.-Him., Dzu.-Kash., Mong., Jap.-Chi., N. Am., Tib. Described from Europe. Type in London.

Economic importance. The Kirghiz people extract a dye for wool from the roots of this plant (V. V. Nikol'skii, 1911).

Tribe 7. **ANAGALLIDEAE** Rchb. Fl. Germ. exsc. (1832) 408.—Corolla with a short tube, sometimes shorter than calyx; aestivation convolute; capsule circumscissile; ovary superior. Plants with leafy stems.

Genus 1128. **ANAGALLIS*** L.**

L. Sp. pl. (1753) 148.

Flowers solitary, on long axillary pedicels; calyx 5-parted to base, the segments lanceolate or subulate, spreading; corolla azure, white, bright red, lateritious, or orange-red, rotate-campanulate or rotate, deciduous, the tube very short or obsolescent, the limb 5-parted mostly to base; corolla lobes broad, obovate or linear, obtuse or [?] ciliate-glandular, entire or erose; stamens 5, free or rarely more or less connate, attached at base of corolla, the filaments bearded or rarely glabrous; anthers more or less ellipsoid, obtuse; style with a globose ovary, filiform style, and obtuse stigma; capsule globose, membranaceous, many-seeded, circumscissile; seeds minute, flat at the back and conical at face. Annual plants; stems simple or branched, decumbent or ascending to erect, terete or 4-angled; leaves opposite or alternate, rarely in threes, entire, short-pediceled.

Of the 24 species, distributed through Europe, N. and S. Africa, W. Asia, and S. America, two species occur in the USSR.

- 276 1. Corolla bright red, orange-red, or brick-red; corolla lobes ovate, finely glandular-ciliolate on the margin 1. **A. arvensis** L.
+ Corolla azure; corolla lobes denticulate on the margin, not glandular.
. 2. **A. coerulea** Schreb.

1. **A. arvensis** L. Sp. pl. (1753) 148; M.B. Fl. taur.-cauc. I, 143; Duby in DC. Prodr. VIII, 69; Ldb. Fl. Ross. III, 1, 29; Boiss. Fl. or. IV, 6; Shmal'g. Fl. II, 201.—**A. latifolia** L. Sp. pl. (1753) 148.—**A. phoenicea** Scop. Fl. Carn. ed. 2, 1 (1772) 139; Grossg. Fl. Kavk. III, 213.—**A. carnea** Schrank, Baier. Fl. I (1789) 461.—**A. arvensis** β . **phoenicea** flore Willd. Sp. pl. I, 2 (1797) 822.—**A. arvensis** α . **phoenicea** Ldb. Fl. Ross. III, 1 (1847-1849) 29; Boiss. Fl. or. IV, 6; Shmal'g. Fl. II, 201.—**A. arvensis** β . **carnea** Ldb. l.c. 30.—**A. phoenicea** var. **carnea** C. Koch in Linnaea, XXIII (1850) 606.—**A. arvensis** subsp. **phoenicea** (Scop.) Schinz und Keller in Hegi, III. Fl. V, 3 (1927) 1869.—Ic.: Rchb. Ic. Fl. Germ. XVII, 27, tab. 1082; Hegi, l.c. tab. 211, f. 5, 5a-5e, 1d, 6c; Sori. rast. SSSR, III, Figs. 342,

* A plant name mentioned by Dioscorides.

** Arranged by S. G. Gorshkova.

343; Fl. Yugo-Vost. VI, Fig. 564.—Exs.: Ed. Hort. Bot. Petri Magni No. 84; Fl. pol. exs. No. 561; Fl. Bohem. et Morav. exs. No. 1072; Herb. norm. No. 4483; Fl. exs. Reipubl. Bohem.-Sloven. No. 253.

Annual or biennial, glabrous, 5-30 cm tall; stems often numerous, 4-angled, short-winged, decumbent or ascending, branched, the branches often fairly long; leaves opposite, rarely in threes, ovate or oblong-ovate, 0.6 (0.8)-1.3 (1.5) cm long, 0.2-0.8 cm broad, pale green, sessile, obtuse, black-dotted beneath, distant, somewhat spreading; flowers solitary; pedicels 1.2-1.4 cm long, axillary, half as long again to twice as long as the leaves, almost reclinate in fruit; calyx 3.5 mm long, shorter than corolla; calyx segments lanceolate to lance-linear, 3 mm long, 0.5-0.7 (1) mm broad, acute, hyaline-margined, entire; corolla reddish or sanguineous or lateritious, 4.5-5 mm long, rotate, the limb 5-parted nearly to base; corolla lobes oval-ovate, 4.5 mm long, 2.7 mm broad, obtuse, finely glandular-ciliate on the margin (the cilia mostly 3-celled); stamens 5; filaments 1.5 mm long, about one-third the length of corolla, bearded; ovary globose, 0.8 mm long; style filiform, 1.5 mm long; stigma obtuse; capsule globose, membranaceous, many-seeded, 3.5 mm long, circumscissile; seeds ovoid-trigonal, 1.3 mm long, 0.8 mm broad, minutely tuberculate, dull, dark brown to almost black. April-August.

Valleys, river banks and seashores, bog margins, tugaic soils and meadows, in mountains below the spruce forest zone, and on dry stony slopes. — European part: Dv.-Pech. (Solovetskie Is.), Balt., Lad.-Ilim., U. V., U. Dnp., M. D., V.-Don, U. Dns., Ber., Bl., Crim., L. Don; Caucasus: Cisc., Dag., W., E., and S. Transc., Tal.; Soviet Central Asia: Balkh., Mtn. Turkm., Amu D., Syr D., Pam.-Al., T. Sh. **Gen. distr.:** Scand., Centr. and Atl. Eur., Med., Bal.-As. Min., Ind.-Him. Described from Trieste. Type in Italy.

Note. A common weed in stands of rye, wheat, alfalfa, and corn; fallows and abandoned fields, orchards, vineyards, vegetable gardens, wastelands, commons, roadsides, ditches, near irrigation canals, boundaries of cereal fields, and near habitations. A poisonous plant, containing anagallis-saponin.

2. **A. coerulea** Schreb. Spicil. Fl. Lips. (1771) 5; M. B. Fl. taur.-cauc. I, 143; Grossg. Fl. Kavk. III, 213.—*A. arvensis* a. *coerulea* flore Willd. Sp. pl. I, 2 (1797) 821.—*A. latifolia* C. A. Mey. Verzeichn. Pfl. (1831) 113; non L.—*A. arvensis* γ. *coerulea* Ldb. Fl. Ross. III, 1 (1847-1849) 30; Boiss. Fl. or. IV, 6; Shmal'g. Fl. II, 201.—*A. arvensis* subsp. *coerulea* (Schreb.) Schinz. et Keller in Hegi, Ill. Fl. V, 3 (1927) 1870.—Ic.: Rchb. Ic. Fl. Germ. XVII, tab. 1082; Hegi, l. c. tab. 211, f. 5f.—Exs.: Fl. exs. Austro-Hung. No. 1357, No. 3691; Fl. Bohem. et Morav. exs. No. 967; Herb. norm. No. 4485.

Annual; glabrous, (2) 5-30 cm tall; stems 4-angled, short-winged, often decumbent or ascending, branched, the branches mostly elongated; leaves opposite, rarely in whorls of 3, sessile, ovate to oblong-ovate, 1-1.5 cm long, 0.4-0.8 cm broad, almost pointed, dark green, dotted beneath with minute black glands; flowers solitary; pedicels 1.5-2 cm long, slightly exceeding the leaves, axillary, nodding in fruit; calyx 4.5-5 mm long, slightly shorter than corolla; calyx segments 3.5-4 mm long, 1 mm broad, lanceolate to lance-linear, acute, hyaline-margined, entire; corolla

azure, rotate, (4) 5-6 mm long, the limb 5-parted nearly to base; corolla lobes oval, 3.5-3.8 mm long, 1.7 mm broad, obtuse, denticulate on the margin, without glands, the hairs on the margin of petals 4-celled; stamens 5; filaments 2.5-3 mm long, about half the length of corolla, bearded; ovary globose, 0.7 mm long; style filiform, 2 mm long; stigma obtuse; capsule globose, membranaceous, 3.5 mm long, yellowish, many-seeded, circumscissile; seeds ovoid, trigonous, 1.5 mm long, 1.3 mm broad, dark brown to nearly black, finely tuberculate, dull. May-August.

Meadows, needle-grass and witch-grass steppes, forest glades, dry stony slopes, scrub. — European part: U. Dns., Bes., Bl., Crim.; Caucasus: Cisc., Dag., W., E., and S. Transc., Tal.; W. Siberia: Alt. 278 (Mt. Sarym-Sakty); Far East: Kamch. (Mil'kovskii experimental area); Soviet Central Asia: Ar.-Casp., Balkh., Mtn. Turkm., Amu D., Syr. D., Pam.-Al., T. Sh. **Gen. distr.:** Centr. and Atl. Eur., Med., Bal.-As. Min., N. Am. Described from the vicinity of Leipzig. Type in Berlin.

Note. As pointed out, this species differs from the closely related *A. arvensis* L. in the azure corolla with oval denticulate-margined glandless lobes and its distribution in the SW part of the USSR. In W. Siberia, Altai, and Kamchatka it occurs sporadically and undoubtedly as a weed. A weed in fields of wheat, rice, and cotton; at roadsides, gardens, vineyards, and on the banks of irrigation canals.

Bieberstein (Fl. taur.-cauc. I, 143) reports *A. Monelli* L. from the Crimea (Kerch). In the absence of herbarium specimens of this plants, it has been impossible to determine to which plant this name refers. However, a specimen preserved in the herbarium of the Botanical Institute of the Academy of Sciences of the USSR under the name of *A. Monelli* β . *verticillata*, carries a label with the inscription: "An ex Tauria? Bosphorum versus". In view of these facts, we refrain from including *A. Monelli* L. in the "Flora of the USSR".

A. tenella L., distributed chiefly in W. Europe (W. part) and in the Mediterranean region (W. part), is reported by Schmalhausen (Fl. II, 201) for Bessarabia and Poland with a question mark, and also by Hegi (Ill. Fl. V, 3, (1871)) for the Crimea, and by Ledebour (Fl. Ross. III, 1, 30) for E. Siberia, also tentatively. The occurrence of *A. tenella* L. in the USSR has not been confirmed by anybody, and the plant is not to be found in the herbarium of the Botanical Institute of the Academy of Sciences of the USSR.

Genus 1129. **CENTUNCULUS*** L. **

L. Sp. pl. (1753) 116.

Flowers solitary, terminal, subsessile or short-pedicelled in the leaf axils; calyx 4-parted at base; corolla urceolate-rotate or cupuliform or subspherical, deeply 4-parted, deciduous; stamens 4, attached at base of corolla lobes, the filaments short glabrous, the anthers ellipsoid; style with globose ovary, filiform style, and capitate stigma; capsule globose, coriaceous, unilocular, many-seeded, circumscissile; seeds small. Very small annuals, with densely leafy stem, the leaves alternate.

Of the three species distributed through Europe, Asia Minor, and North America, one occurs in the USSR.

* Name of a weed mentioned by Pliny.

** Arranged by S. G. Gorshkova.

1. **C. minimus** L. Sp. pl. (1753) 116; Ldb. Fl. Ross. III, 1, 301; Shmal'g. Fl. II, 202; Maevsk. Fl. Ed. 7, 571.— Ic.: Fedch. and Fler. 279 Fl. Evrop. Rossii, 741, Fig. 627; Syreishch. Ill. Fl. Mosk. gub. 3, 22; Fl. Yugo-Vost. VI, Fig. 565.— Exs.: GRF, No. 69; Pl. Finland. exs. No. 1274, 1275; Fl. exs. Austro-Hung. No. 1358.

Annual, (1.5) 3-7 (10) cm tall, glabrous, with a weak slender root; stem slender, erect or decumbent, simple or branched, rather densely leafy; leaves alternate, ovate or rounded-ovate, 2.5-6 mm long, 2-2.5 mm broad, short-pointed, entire, subsessile or with a pedicel 0.5 mm long; flowers very small, solitary, or borne on pedicels 0.5 mm long, axillary; calyx 2.5-3 mm long; calyx segments narrow, linear-lanceolate, 2-2.5 mm long, 0.3-0.4 mm broad, pointed-subulate; corolla white or pink, urceolate-rotate or cupuliform, about half the length of calyx, the enlarged almost inflated or spherical tube 0.6-0.8 mm long and 0.6 mm broad, the lanceolate acuminate lobes 0.6-0.7 mm long, and 0.3 mm broad; stamens 4; filaments glabrous, 0.2 mm long, half the length of corolla lobes; anthers cordate or elliptic, in introrse; ovary 0.4-0.5 mm long; style filiform, 0.5 mm long; stigma capitate; capsule globose, membranaceous, yellowish, 1.5-1.7 mm long, circumscissile, smooth; seeds numerous, small, 0.5 mm long, trigonous or subovoid, minutely verrucose, dark brown. May-June-September.

Bog margins, sand dunes, and dampish sands.— European part: Balt., Lad.-Ilm. (Pskov), U. V., U. Dnp., M. D., V.-Don, Transv. (Marks), Bl., L. Don. **Gen. distr.:** Scand., Centr. and Atl. Eur., Med., Bal.-As. Min., N. Am. Described from Europe. Type in London.

Note. A weed in ricefields, abandoned land, fallows, pastures, and gardens.

Tribe 8. **CYCLAMINEAE** (Rchb.) Pax in Engl.— Pr. Pflanzenf. IV, 1 (1891) 104-115; Rchb. Fl. Germ. exsc. 406, pro subtr.— Corolla with reflexed lobes; capsule dehiscent with valves; ovary superior. Plants with basal leaves and leafless scapes or single-flowered subradical peduncles, forming rootstocks or tubers.

Genus 1130. **CYCLAMEN** * L. **

L. Sp. pl. (1753) 145.

Calyx 5-parted; corolla tube short, subspherical, the lobes reflexed; stamens 5, attached at base of corolla tube; anthers broadly or narrowly 280 lanceolate, acuminate, nearly always enclosed in the tube; ovary unilocular, the placenta subspherical; style filiform, included or slightly exserted; ovules numerous; capsule globose or ovoid, opening at apex by 5-8 semi-reflexed teeth; fruiting peduncles of the native species always spirally twisted; hence the capsules almost lying on the ground; seeds semiglobose, angular. Herbaceous perennials, with a subglobose more or less flattened tuber; leaves reniform, orbicular, or ovate, always cordate at base; flowers solitary, nodding.

* From Greek *cyclos* = circle, alluding to the shape of the tubers.

** Arranged by E. G. Pobedimova.

A Mediterranean genus, containing about 55 species, distributed in mountains, chiefly along the coasts of the Mediterranean, the Black Sea, and the southern part of the Caspian Sea.

Note. All the species are poisonous. The active principle is the saponin cyclamin with the composition $C_{56}H_{96}O_{29}$ and the glucoside saponin-cyclamyretin, $C_{28}H_{46}O_4$. The toxic substance belongs to the rare kind which acts in different ways on living organisms. Thus, cyclamen tubers, while toxic to most animals, provide perfectly harmless fodder for swine. The tubers of Caucasian cyclamens are used in the production of homeopathic drugs. Like anabasin, cyclamen toxin kills the red spider mite, a pest of subtropical crops.

All cyclamen species are ornamental; some have long been in cultivation (*C. coum* Mill., *C. vernal* Sw., *C. europaeum* L., *C. persicum* Mill.).

1. Tuber covered all over with roots; leaf margins serrate. 1. *C. ponticum* (Alb.) Pobed.
- + Tuber with a tuft of roots at base; leaves entire 2.
2. Petals with a dark violet or rose blotch at throat 3.
- + Petals with two white spots at throat 5.
3. All plant parts small: leave 11-14 mm long and 12-15 mm broad; petals 5-6 mm long; tuber 12-15 mm in diameter 2. *C. parviflorum* Pobed.
- + All plant parts larger: leaves 23-60 mm long and broad; petals 8-19 mm long; tuber 2-10 cm in diameter 4.
4. Petals oblong, the broadest part below the middle; calyx segments lanceolate, acute; leaves triangular-ovate (Talysh) 8. *C. elegans* Boiss. et Buhse.
- + Petals broadly ovate, narrowed toward base; calyx segments oblong-oval, obtuse, the margin slightly and bluntly denticulate; leaves orbicular 3. *C. circassicum* Pobed.
- 281 5. Corolla lobes oval, 9-12 mm long and 7.5-8 mm broad, lilac-rose, revolute; leaves broadly triangular-ovate, diffusely variegated with a greenish-silvery pattern (Georgia) 5. *C. vernal* Sw.
- + Corolla lobes orbicular or obovate or ovate and, if oval, then larger, up to 19 mm long, turned sideways toward the tube; leaves reniform or orbicular or ovate, elongate toward apex 6.
6. Flowers large; corolla lobes 11-19 mm long, 8-13 mm broad, oval to suborbicular, white or pale rose or bright rose; leaves ovate, elongate toward apex, or orbicular 7.
- + Flowers small; corolla lobes 8-15 mm long, 7-10 mm broad, obovate or orbicular, bright rose, rarely white; leaves reniform, the ratio of length to breadth averaging 2.5:4 (Cisc., W. Transc., Krasnaya Polyana). 4. *C. coum* Mill.
7. Corolla lobes suborbicular; leaves orbicular or broadly ovate, the ratio of length to breadth averaging 3.5:4, the upper surface variegated with a greenish-silvery pattern (Adzharia) 6. *C. adsharicum* Pobed.
- + Corolla lobes oval; leaves ovate, the ratio of length to breadth 4:4, the upper surface clearly variegated with a whitish-silvery pattern (Abkhaz ASSR). 7. *C. abchasicum* (Medw.) Kolak.

Section 1. **AURICULATUM** Schwz. in Gartenfl. (1938) 11. — Limb of petals narrowed at base and enlarged upward, eared.

Series 1. **Radiciosa** Schwz. l.c. — Surface of tubers covered with roots.

1. **C. ponticum** (Alb.) Pobed. in Bot. zhurn. SSSR, XXXIII, 2 (1948) 223. — *C. europaeum* α . *typicum* Alb. β . *ponticum* Alb. in Bull. Herb. Boiss. II (1854) 254; Pax et Knuth in Engl. Pflanzenr. IV, 237, 250. — *C. europaeum* var. *colchicum* Alb. in Tr. Tifl. Bot. sada, 1 (1895) 166. — *C. europaeum* Kusn. in Mat. Fl. Kavk. IV, 1 (1902) 168; Grossg. Fl. Kavk. III, 214. — *C. europaeum* ssp. *ponticum* (Alb.) Schwz. in Gartenfl. (1938) 11. — Ic.: Pobed. l.c. Fig. 1.

Perennial; tuber 25-35 mm in diameter, globose, covered all over with roots; stems terminating in leaves, 5-15 cm long; leaves reniform, 3-8 cm long and broad, rarely variegated with a faint whitish-green narrow pattern, 282 red beneath, minutely and bluntly crenulate; calyx 3.7 cm and peduncle 3-10 cm long, both covered with reddish papilliform hairs; flowers solitary, nodding, fragrant, rose-colored; calyx green, with dark red nerves when live, covered with scattered short appressed hairs, deeply 5-parted; calyx segments broadly ovate, 1.5-2 mm long in drying, 3-3.5 mm long and 3.5-4 mm broad in life, acuminate, always toothed; corolla tube spherical, white; corolla lobes oblong or obovate-elongate, obtuse, rose, the violet-rose spot at base descending ligulately into the tube; anthers ovoid, obtuse, covered dorsally and ventrally with warts, these violet in drying but white when live; filaments 0.6 mm long, strongly dilated at base; ovary globose, covered with short appressed hairs; style long, exerted 3-4 mm from the tube; capsule globose, 5-7-toothed; peduncle spirally coiled in fruit; seeds ferruginous, angled. August-October (Plate XV, Figure 1).

Alpine meadows and calcareous rocks, at altitudes from 300 to 2500 m. — Caucasus: W. Transc. (Abkhaz ASSR, Svanetiya, Tbilisi, and Kutaisi areas). Endemic. Described from southern Abkhaz ASSR. Type in Leningrad.

Note. This species was placed by Schwarz in the section *Psilanthum* Schwz. as subspecies of *C. europaeum* subsp. *ponticum* (Alb.) Schwz. We refer it to the section *Auriculatum* Schwz., since Glasau established in 1939 (Planta, XXX) that *C. europaeum* and the related species *C. ponticum* are both eared in the throat. We consider *C. ponticum* as genetically akin to the group of species (*C. africanum*, *C. neapolitana*) that were classified by Schwarz under the series *Radiciosa*. M.I. Kotov (Adventivna roslinnist' na Ukraini. Visnik prirodoznavstva, 1929, 273), in listing the adventive plants of the Ukraine, mentions a naturalized *Cyclamen europaeum* L. in the parks of Aleksandriya and near Kiev. He regards this plant as having escaped from cultivation in botanical gardens. In order to enable identification of this European species of cyclamen, often grown in the open in USSR gardens, we shall point out the characteristics distinguishing it from *C. ponticum*. Leaves of the European cyclamen are elongated toward the apex, strongly crenate, and white-variegated on the upper surface, as opposed to the rounded-reniform, coriaceous, commonly plain green or very faintly white-variegated, or minutely crenulate leaves of *C. ponticum*. The peduncles of the European species are 15-25 cm long (not 3-6 cm), rarely 15 cm;

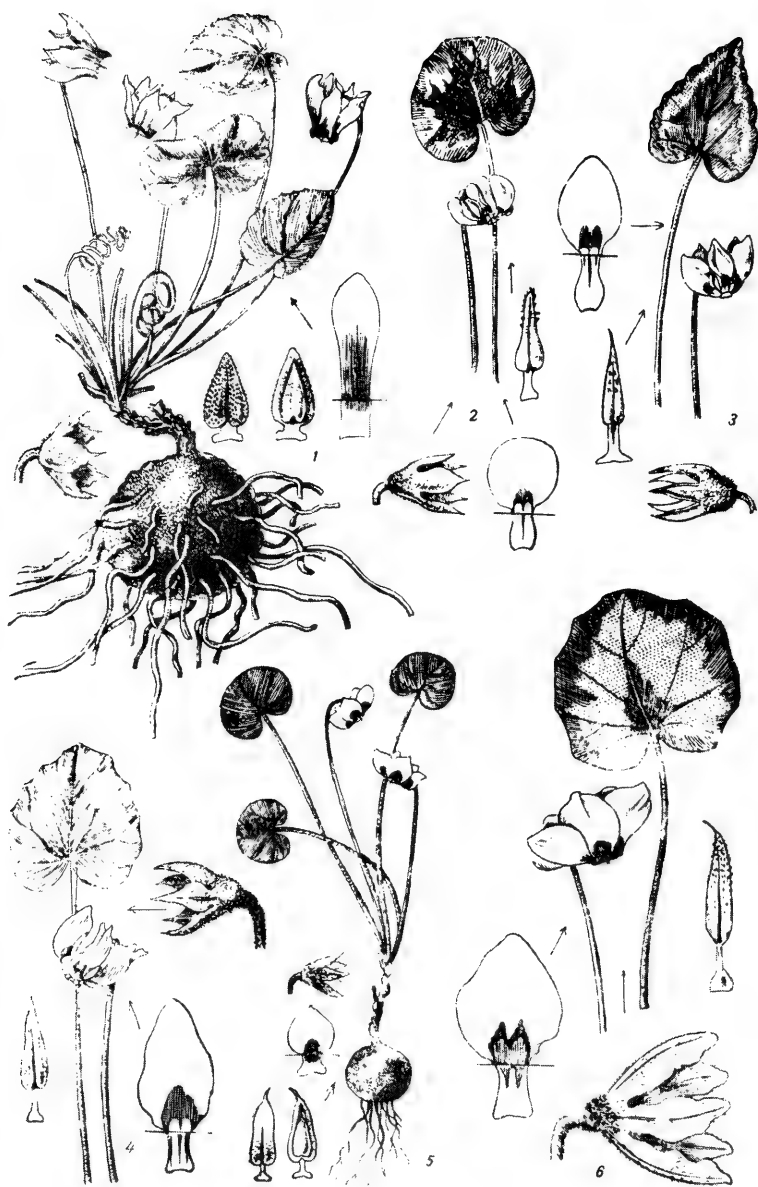


Plate XV

1. *Cyclamen ponticum* (Alb.) Pobed. 2. *-C. coum* Mill. 3. *C. abchasicum* (Medw.) Kolak.
 4. *C. elegans* Boiss. et Buhse. 5. *C. parviflorum* Pobed. 6. *C. circassicum* Pobed.

flowers large, the reflexed part of petals 2.5-3.5 cm and not 1.4-2 cm long as in *C. ponticum*.

285 Section 2. **PSILANTHUM** Schwz. l.c. — Limb of petals not narrowed at base, not eared.

Series 1. **Pubipedia** Schwz. l.c. — Roots attached in a tuft at base of tuber.

2. **C. parviflorum** Pobed. in Bot. Mat. Gerb. Bot. inst. AN SSSR, IX (1946) 248. — Ic.: Pobed. l.c.:

Perennial, small in all parts, 5-12 cm tall; tuber globose, 1.2-1.5 cm in diameter, with leaf-bearing shoots 1-4 cm long; leaves reniform-orbicular, 11-14 mm long and 12-15 mm broad, green above, carmine-red beneath, sparsely covered on both sides with short hairs or glabrate, the blades overlapping or bordering; petioles and peduncles long (3.5-6 cm), slender, rather densely covered with short hairs; flowers rose, with a dark violet blotch at base of limb and at throat; calyx reddish, with short appressed brown hairs; calyx segments broadly lanceolate, 3 mm long, entire or very slightly and minutely denticulate; corolla tube about as long as the limb, the lobes orbicular or oblong-orbicular; anthers broadly lanceolate, pointed at apex, brown-verrucose at base on both sides; filaments 0.5 mm long, dilated at base; ovary globose, covered with short brown hairs; style long, exerted 1 mm from the corolla tube; capsules unknown. Fl. June (Plate XV, Figure 5).

Alpine zone and spruce forests with mossy ground-cover. — So far not found in the USSR. Collected in the adjoining Artvin region of Turkey, whence described. Type in Leningrad.

Note. *C. parviflorum* Pobed. is a species displaying distinct characteristics. We place it conditionally in this series, for lack of material concerning Iranian species which undoubtedly included forms allied to *C. parviflorum*.

3. **C. circassicum** Pobed. in Bot. zhurn. SSSR, XXXIII, 2 (1948) 226. — *C. coum* var. *grandiflorum* Steup in herb.

Perennial; leaves orbicular, 4 cm long and 4-5 cm broad, cordate at base, white-blotched above over nearly the entire surface, green beneath, with short hairs on the veins and on the margin; petioles and peduncles 13-17 cm long, covered with red papilliform hairs; flowers large (white?); calyx 12 mm long, deeply 5-parted; calyx segments oblong-oval, obtuse, slightly and bluntly toothed on the margin, green, covered with short reddish hairs, the mid-nerve reddish; corolla lobes broadly ovate, obtuse, narrowed toward base, the dark violet blotch at throat descending into the tube; corolla tube subspherical, 7 mm long, white, covered with violet hairs; anthers lanceolate, acuminate, yellow, brownish-verrucose on the back, exerted from the throat; filaments 2 mm long, strongly dilated at base; ovary globose, glabrate; style 6 mm long, exerted 1 mm from the throat; tuber and capsule unknown. Fl. December (Plate XV, Figure 6).

286 Rocks. — Caucasus: W. Transc. Endemic. Described from Akhtsu Gorge on the Krasnaya Polyana highway. Type in Leningrad.

Note. An apparently related species that we had intended to describe but have not presented because of inadequacy of the herbarium specimen, is *C. bzybicum*, preserved in the herbarium of the Tbilisi Botanical Institute. This specimen was collected by Al'bov in the alpine zone of the Bzub Range on Dzin Pass. While displaying the general characteristics of the series (the absence of white spots at the corolla throat and the orbicular leaves), it differs from *C. circassicum* in the obtuse (as against acute) lanceolate (not oblong) sepals and much smaller flowers. It is distinguished from *C. parviflorum* by the much larger size and the white-variegated leaves. The nature of the tuber of this sample has not been established.

4. *C. coum* Mill. Gard. Dict. ed. VIII (1768) No. 6; M.B. Fl. taur.-cauc. I, 139; Ldb. Fl. Ross. III, 23; Duby in DC. Prodr. VIII, 56; p.p.; Stev. in Bull. Soc. Nat. Mosc. XXX, II, 326; Boiss. Fl. or. IV, 11, p.p.; Alb. Prodr. fl. Colch. 166, p.p.; Shmal'g. Fl. II, 198 (quoad specimina taurica); Hildb. Monogr. Cycl. 48; Kuzn. in Mat. Fl. Kavk. IV, 1, 163; Lipskii, Fl. Kavk. 384; Radde, Mus. Cauc. II, 124, p.p.; Grossg. Fl. Kavk. II, 214.—*C. europaeum* Pall. Ind. taur. in Nov. Act. Petrop. X (1797) 306 (non L.).—*C. orbiculatum* var. *coum* Doorenb. in Mededel. Landb. te Wagen. (1950) 25.

Perennial; tubers dark brown, 2-3.5 cm in diameter; leaves reniform, the ratio of length to breadth 2.5:4, the upper surface variegated with white or otherwise; flowers bright rose, rarely white, small; corolla lobes obovate or orbicular, 8-15 mm long and 7-10 mm broad, turned sideways to the tube, the small broad dark lilac blotch at the base descending with three stripes into the tube, the curvature of petals with two white spots; filaments of stamens slightly dilated at base; anthers yellow, not pointed at apex, white-verrucose on the back; style short, enclosed in the flower throat; ovary globose, covered with scattered reddish hairs; capsule globose, dehiscent with 5-8 reflexed teeth; seeds small, hemispherical, angular. Fl. February-March; fr. May-June (Plate XV, Figure 2).

Mountain woods, mostly oak.—European part: Crim.; Caucasus: Cisc., 287 W. Transc. **Gen. distr.:** Bal.-As. Min. Described from a cultivated specimen of unknown origin, although the specific denomination seems to point to Cos Island in the Aegean Sea as the original habitat of this species. Type in London.

5. *C. vernum* Sw. Brit. Flow. Gard. I (1823) tab. 9; Schwz. in Gartenfl. (1938) 11; Glasau in Planta, 30, 3, 512; Pobev. in Bot. zhurn. SSSR, XXXIII, 2, 221; Bot. Mat. Gerb. Bot. inst. AN SSSR, XIII, 192.—*C. vernale* C. Koch in Linnaea, XVII (1843) 308.—*C. europaeum* M.B. Fl. taur.-cauc. I (1808) 140 (quoad pl. ex Iberia); Duby in DC. Prodr. VIII, 56 (quoad specimina prope Tphilisi lecta); Ldb. Fl. Ross. III, 23 (quoad pl. ex Iberia).—*C. coum* Beket. Ocherk. Tifl. fl. (1853) 20; Boiss. Fl. or. IV, 11 (quoad specimina ex Iberia).—*C. ibericum* Stev. in herb. berol. descrip.; Lemaire in Jard. fleur. III, tab. 247 (nec Goldie); Pax et Knuth in Engl. Pflanzenz. IV, 237, 252 (quoad specimina ex Iberia); Grossg. Fl. Kavk. III, 214 (quoad specimina ex Iberia).—*C. coum* var. *ibericum* Boiss. l.c. p.p.; Kuzn. in Mat. Fl. Kavk. IV, 1, 166, p.p.—*C. caucasicum* Willd. herb. No. 3508.—*C. sp. Iensh*, Spis. rast. (1843) 59 (species from Megreliya*).—*C. orbiculatum* Doorenb. in Mededel. Landb. te Wagen. (1950) 23, p.p. (non Mill.).

* [Or Mingrelia, area in W. Georgia SSR between Ingur and Rion rivers.]

Perennial; tubers 3-5 cm in diameter, giving rise to leaf-bearing shoots 5-10 cm long, while penetrating downward in the soil; leaves broadly ovate, triangular-tipped, the ratio of length to breadth 3-3.5:4, the upper surface variegated with a greenish-silvery rather broad pattern, carmine-red beneath; petioles and peduncles covered with short thick hairs; flowers small, rich lilac-rose, never white; calyx united to about the middle, covered with papilliform reddish hairs; calyx segments lanceolate, acute, 4-5 mm long and 2 mm broad; corolla tube oblong, inflated, 5 mm long, white outside, on the inside with three unequal dark lilac stripes opposite each corolla lobe; lobes oval, 9-12 mm long, 7.5-8 mm broad, obtuse, with a large dark violet blotch at the base and two white spots on the curvature, slightly reflexed at the margins; stamens 4-5 mm long; filaments 1 mm long, dilated at base; anthers bright yellow, lanceolate, white-pointed at apex, covered on the back in upper part with white papilliform hairs; ovary globose, covered with short hairs; style 4-5 mm long; stigma truncate, flat, papillose; capsule globose, dehiscent with 5-8 teeth; seeds brown, angular. Fl. February-March; fr. May-June.

Mountain woods and scrub on mountain slopes. — Caucasus: E. Transc. Endemic. Described from a specimen of unknown origin. Type not preserved.

288 Note. In spite of unavailability of the type specimen, it has been possible, with the aid of the illustration supplied by Sweet with the original description and the publications by recent authors which refer to *C. vernum*, to ascertain that the specimen on which Sweet's was based had originated from Georgia.

6. *C. adsharicum* Pobed. in Bot. Mat. Gerb. Bot. Inst. AN SSSR, XIII (1950) 189. — *C. coum* Kusn. in Mat. Fl. Kavk. IV, 1, 163 (pl. Artvin.), non Mill. — *C. coum* var. *ibericum* Kusn. l.c. 167 (pl. Adshar.) non Boiss.

Perennial; tubers large, up to 8.5-10 cm in diameter, dark brown, in the course of downward penetration into the soil giving rise to shoots 5-10 cm long; leaves orbicular or broadly ovate, the ratio of length to breadth averaging 3.5:4, the upper surface variegated with a broad greenish-silvery pattern, the lower surface green or reddish, the margin nearly always with protruberances at the termination of veins; petioles and peduncles 6-21 cm long, densely covered with short hairs; calyx reddish, covered with appressed reddish hairs; calyx segments lanceolate, acute, 4-5 mm long and 1.5 mm broad; corolla tube subspherical, 5-6 mm long, white outside, three unequal dark violet stripes (the middle longer than the lateral ones) situated inside, opposite each corolla lobe; lobes suborbicular, 14-15 mm long and 11-12 mm broad, turned sideways toward the tube, with a small dark violet blotch at the base and two white spots on the curvature; filaments of stamens 1 mm long, bright yellow, lanceolate, white-pointed at apex, the back covered in upper part with white papilliform hairs; ovary globose, covered with short hairs; style 4-5 mm long; stigma truncate, flat, papilliform; capsule globose, dehiscent with 5-7 teeth; seeds angular, concave on the back, depressed ventrally, ferruginous or brown. Fl. January-March; fr. May-June.

Mountain (often beech) woods and scrub on mountain slopes. — Caucasus: W. Transc. (Adzharistan). **Gen. distr.:** Bal.-As. Min. Described from Zeleniy Mys (Batumi Botanical Garden). Type in Leningrad.

7. **C. abchasicum** (Medw.) Kolak. Fl. Abkh. III (1948) 274; Pobed. in Bot. Mat. Gerb. Bot. inst. AN SSSR, XIII (1950) 194. — *C. coum* var. *abchasicum* Medw. ex Kusn. in Mat. Fl. Kavk. IV, 1, (1902) 167. — *C. europaeum* Ldb. Fl. Ross. III (1847-1849) 23 (pl. Abchas.). — *C. coum* Schmalh. Fl. II (1896) 198 (pl. Abchas.), non Mill.; Radde, Grundz. (1899) 357 (non Mill.). — *C. calcareum* Kolak. in Byull. Glavn. Bot. Sada, 3 (1949) 83. — *C. orbiculatum* f. *album* Doorenb. in Mededel. Landb. te Wagen. (1950) 24.

289 Perennial; tuber 1.5-3.5 cm in diameter, globose, brown, often with shoots 5-10 long when deep-seated in soil; leaves ovate, 3-6 cm long, 2.5-5 cm broad, as long as or longer than they are broad, the ratio of length to breadth averaging 4:4, rarely suborbicular, the upper surface intensely variegated with white, dark carmine-red beneath, entire or with protruberances at the termination of veins; petioles and peduncles 6-20 cm, mostly 12-13 cm long, covered with short reddish hairs; flowers white or pale rose, rarely bright rose; calyx deeply 5-parted, covered with short hairs; calyx segments narrowly lanceolate, long-acuminate, 5-7.5 mm long, 1-2 mm broad, exceeding the corolla tube; corolla tube 5-6 mm long, spherical, white, with three unequal dark violet stripes inside, under each lobe; corolla lobes large, 11-19 mm long, 8-13 mm broad, oval, obtuse, ovate or suborbicular, with a dark violet blotch at base and two white spots on the curvature; reversed in relation to tube; stamens 5 mm long; filaments 1-1.5 mm long, dilated at base; anthers yellow, lanceolate, acuminate, with white papilliform hairs on the back; ovary globose, covered with short appressed hairs; style 5-6 mm long; stigma truncate, covered with papilliform hairs; capsule globose, dehiscent with 5 teeth; seeds ferruginous, hemispherical, angular. Fl. February-March; fr. May-June (Plate XV, Figure 3).

Mountain woods and scrub on mountain slopes. — Caucasus: W. Transc. Endemic. Described from Abkhaz ASSR. Type in Leningrad.

Note. The polymorphism of this species was noted long ago. K. Flaksberger (1910) applied biometrical methods to study this phenomenon. N.I. Kuznetsov (1901) interpreted the polymorphism of this species as a result of hybridization with *C. coum* Mill. which stands very close as regards its morphology and distribution area; he assumed that the various forms were secondary generations. A.A. Kolakovskii (1949, 1950) made an insufficiently substantiated attempt to systematize this variability of forms of *C. abchasicum*. Thus, he separated *C. calcareum* Kolak. on account of its elongated leaves, the rhomboid corolla lobes, and a white stripe instead of two white spots on the curvature of petals — all these characters having been observed only for a single specimen raised in the Sukhumi Botanical Garden. All these characters were observed in nature on numerous specimens of *C. abchasicum*. In the absence of a distinct distribution area, this form can hardly be considered as a species distinct from *C. abchasicum*. Beside this species, Kolakovskii separated the following varieties, chiefly according to perianth coloration: var. *albi-florum*, var. *purpureum*, var. *nervosum*, var. *albomaculatum*, and var. *roseum*, but this scarcely exhausts all the color variations of *C. abchasicum*.

8. *C. elegans* Boiss. et Buhse in Nouv. Mem. Soc. Mosc. XII (1860) 145; Grossg. in Izv. Kavk. Muzeya, XI, 3-4, 303; Pobedim. in the journal "Priroda" [Nature], 10 (1936) 76; in Bot. zhurn. SSSR, XXIII, 2, 221.—
 290 *C. coum* β . *ibericum* Boiss. Fl. or IV (1879) 11 (pl. Talysch.).—
C. vernum Glas. in Planta, XXX (1939) 512 (pl. Talysch.); Turrill in Curtis Bot. Mag. CLXV, 111 (pl. Talysch.).—*C. orbiculatum* Doorenb. in Mededel. Landb. te Wagen. (1950) 23, p. p. non Mill.

Perennial; tuber 3 cm in diameter; stems very short or elongating with the downward penetration of the tuber, up to 1.5-2 cm; leaves triangular-ovate, cordate at base, the upper surface dark green, faintly variegated greenish-white, the lower surface red; petioles 8-22 cm long; petioles, peduncles and calyces covered with short thick brown hairs; calyx reddish, with broadly lanceolate segments; flowers large, rose, with a violet blotch on the narrow part of the limb, the curvature the same color as the petal; corolla tube rosy-white outside, with three violet stripes inside, opposite each corolla lobe; petals ovate, broadest below the middle, the margin crenate; filaments of stamens short, scarcely dilated at base; anthers lanceolate, not pointed at apex, yellow, with short fleshy lilac hairs on the back; style long, white, exerted from the throat; throat broad, not constricted at the curvature of the petals; capsule globose; dehiscing with 8 teeth. Fl. January-March; fr. May-June (Plate XV, Figure 4).

Beech woods on mountain slopes.—Caucasus: Tal. **Gen. distr.:** Iran (along the Caspian coast). Described from Astrabad. Type in Leningrad.

Genus 1131. **DODECATHEON** * L.**

L. Sp. pl. (1753) 144; Knuth in Engl. Pflanzenr. IV 237 (1905) 234.

- Calyx 5-parted; calyx segments reflexed, becoming erect in fruit; corolla tube very short, enlarged and somewhat thickened in throat; corolla lobes 5, unequal, greatly exceeding the calyx, strongly reflexed; stamens 5, inserted in throat; filaments very short, united into a tube, in some species wanting; anthers long, oblong-linear, acuminate, exerted, basifixed; ovary ovoid or subglobose; style filiform, the inconspicuous stigma exerted
 291 or enclosed in the throat; ovules numerous, stalked, semianatropous; capsule oblong or cylindrical, dehiscing with 5 apical teeth; seeds small, punctate.

Generic type: *Dodecatheon Meadia* L. (Atlantic North America).

The genus *Dodecatheon* contains 30 species, distributed chiefly through the mountains of the Pacific part of N. America (one species in Atlantic North America). Some of the species of this genus are Arctic high-mountain species, others are associated with prairies and various other habitats of the temperate zone.

Economic importance. Some species are grown as ornamentals in gardens and greenhouses.

1. *D. frigidum* Cham. et Schlecht. in Linnaea, I (1826) 217; Duby in DC. Prodr. VIII, 56; Ldb. Fl. Ross. III, 22; Knuth in Engl. Pflanzenr. IV, 237, 239.—Ic.: Seemann, Bot. Herold Voy. (1852) tab. 9.

* Name composed from the Greek words *dodena* = twelve, and *theos* = god; this may be interpreted as a "dozen of deities" or the flower of twelve gods. The name was most probably given for the number of flowers in the umbel (often twelve in the originally described species).

** Arranged by An. A. Fedorov.

Perennial, 5-10 (15) cm tall, glabrate, smooth; rhizome short, stoutish, oblique, sometimes branching at the top, with brown membranous remnants of old leaves and brown somewhat stringy roots; leaves ovate, subacute to subobtusate, subcuneate or obliquely truncate at base, rather thin, glabrous, nearly entire or irregularly sinuate-dentate, the petiole the length of the blade, slightly winged, 2-5 (6) cm long, 1-1.5 (2.5) cm broad; scapes 1-3 times the length of leaves, considerably elongating in fruit, fairly slender, 1-1.5 mm thick, green and below inflorescence faintly violet, covered with very fine and short glandular hairs (visible with a magnifying glass); inflorescence umbellate, 2-3-flowered; flowers nodding; pedicels arched-recurved, ca. 1 cm long, violet, elongating in fruit up to 3 cm; involucre of 2 or 3 linear-subulate bracts; calyx parted to the middle into reflexed subulately pointed blackish teeth; corolla purple, the lobes up to 15 mm long, oblong-linear, covered with small scattered papillae; anthers large, blackish-yellow; capsule twice as long as the calyx. July-August.

Moss and sedge tundra, humid meadows, often along banks of streams.— Arctic: Chuk (Lavrentiya Bay, Serdtse-Kamen Promontary, Emma Bay in Provideniya Gulf, Chaimenskii spring, Chaunskaya Bay, Senyavin Strait).

Gen. distr.: Islands of the Bering Sea, Arc. Am. (Alaska). Described from Chukchi Peninsula (the shore of Lavrentiya Bay). Type in Leningrad.

Note. The existing descriptions of this species indicate violet coloration of corolla, but live plants do in fact have (according to oral report of 292 B. N. Gorodkov) a dark rose or purple corolla which apparently turns violet only in drying (in herbaria).

Economic importance. Quite suitable for garden cultivation as an ornamental plant.

Family CXXVII. **PLUMBAGINACEAE** LINDL. *

Flowers regular, bisexual; calyx persistent, gamosepalous, 5-nerved, funnelform or obconical (with a rather broad 5-lobed limb) or tubular (the suberect or erect limb with 5 or 10 lobes or teeth), scarious or rarely the tube or the entire calyx herbaceous, straight or oblique at base; corolla polypetalous, the 5 oblong lobes narrowed toward base, scarcely united at base to form a ring or a cup, otherwise free but forming a closed tube by overlapping of the margins, either incurved or not incurved after anthesis, or rarely corolla gamopetalous, the rather long tube terminating in 5 more or less spreading lobes; stamens 5, opposite the petals or corolla lobes, the more or less dilated filaments united at base with corolla tube or petals and very rarely connate at base; anthers bilocular, the locules parallel, deeply biparted at base, attached at the middle; ovary superior, unilocular, with a single placenta; styles 5, free from base or united in their whole

* Arranged by I. A. Linchevskii, except the genera *Plumbagella* Spach, *Armeria* Willd. and *Psylliostachys* (Jaub. et Sp.) Nevsk. In the treatment of the genus *Acantholimon* Boiss., the names proposed for the new species in the herbarium by E. G. Chernyakovskaya have been retained and supplied with descriptions. In the treatment of the genus *Limonium* Mill, partial use was made of the manuscripts of N. P. Ikonnikov-Galitskii (incomplete draft descriptions of 12 species) preserved in the editorial office of the "Flora of the USSR" and the new combinations proposed by this worker have been retained.

length; style capitate of various shape or filiform-cylindrical, finely or rarely coarsely glandular; fruit rather tightly enveloped in and (always?) falling together with the calyx, unilocular, single-seeded, the pericarp dry thinly membranous or angularly ribbed, free (not fused with the seed), opening (apparently as a rule only at the time of seed germination) by various means: by irregular annular rupture in lower part followed by valvular dehiscence in upper part, or with 5 more or less distinct valves, or sometimes circumscissile; seeds with mealy albumen and a straight
293 embryo. Shrubs, subshrubs, or perennial or annual herbs; leaves alternate, simple, fairly broad or very narrow, in some cases narrowly linear and acicular, spiny (the genus *Acantholimon* Boiss.), rarely pinnatifid or lobate; flowers red, rose, purple, violet, yellow, or white, commonly sessile, rarely short-pedicelled, mostly in single- to many-flowered spikes, with various numbers of membrano-herbaceous or scarious bracts (very rarely the bracts herbaceous and leaflike), gathered in a spicate or paniculate or rarely capitate inflorescence, mostly borne on long peduncles, these multi-articulate and leafless or often covered with leaves transformed into membrano-herbaceous scales at the base of nodes.

The family includes about 15 genera with more than 500 species, distributed through all parts of the world, though chiefly in the extratropical part of the northern hemisphere, more particularly in the Eurasian continent. The family includes a number of tannin- and dye-yielding plants (see genus *Limonium* Mill. Russian page 411) and some ornamentals with handsome flowers.

Note. The principles laid down for the classification of genera (and species) of this family in Boissier's classical resume (E. Boissier, *Plumbaginaceae* in DC. Prodr. XII, 1848) have been fully retained and the family has not been subjected to a full-scale revision in spite of the vast new material which accumulated in the course of the past century. This accounts for various innovations adopted in the present work, including the setting up of some new genera; all this, however, with the retention in the general outline of the system proposed for the family by Boissier and full use of the code of generic morphological characters as applied by this author. As a matter of fact, it has not always been possible in all cases to resolve the confusion which resulted from uncritical description of individual species without a comprehensive monographic elaboration of natural groups. This applies particularly to the genus *Limonium* Mill., and also, to some extent, to *Goniolimon* Boiss. and *Acantholimon* Boiss. It must also be pointed out that the family *Plumbaginaceae*, as already mentioned by Boissier, contains numerous hybrid forms, among which there are apparently some intergeneric hybrids. All this should be borne in mind during determination of newly collected material and in the course of further studies.

Fossilized *Plumbaginaceae* are known in the USSR only from fruit remnants.

Limonium cf. *Gmelinii* (Willd.) Ktze.— in early Quaternary layers of L. V. (Kol'makovo).

- 294 1. Styles united throughout their length, except for the fairly long stigmas (Plate XVI, Figure 1b); styles coarsely glandular on the inside; calyx (in wild species of the USSR) rather densely covered with stalked glands (subfamily Plumbaginoideae Kusn.) 2.
- + Style distinct from base (Plate XVI, Figure 4 b; Plate XX, Figures 1b, 3b); stigmas finely glandular throughout; calyx devoid of large stalked glands, rarely- only in species of the genus *Psylliostachys* (Jaub. et Sp.) Nevski and in some species of *Limonium* Mill. — covered with very small glands (subfamily Staticoideae Kusn.) 3.
2. Corolla with a broad limb, rotate, large, half as long again to twice as long as the calyx (Plate XVI, Figure 1a); perennial plants 1132. **Plumbago** L.
- + Corolla tubular, with an erect or suberect limb, small, only about a quarter as long again as the calyx (Plate XVI, Figure 2a); annual plants. 1133. **Plumbagella** Spach.
3. Stigmas capitate. 4.
- + Stigmas filiform-cylindrical (Plate XXI, Figures 1c, 3b) 9.
4. Stigmas hemispherical (Plate XVI, Figure 4b), rarely suboblong-capitate and then plants frutescent with acicular spiny persistent leaves (section *Tragacanthina* Bge. of the genus *Acantholimon* Boiss.) 5.
- + Stigmas oblong-capitate (Plate XIX, Figure 2b); herbaceous perennials with soft deciduous rosulate leaves and large bright or pale rose flowers borne on long many-jointed simple peduncles 1135. **Chaetolimon** (Bge.) Lincz.
5. Ovary in anthesis narrowly linear or fusiform-cylindrical or subovoid, strong attenuated toward the top and passing imperceptibly into the style (Plate XVI, Figure 4b); pulvinate or prostrate shrubs (rarely herbaceous perennials with a short woody caudex), mostly with very narrow or subulate spiny leaves — or rarely spineless — leaves, flat and fairly broad; peduncles nearly always many-jointed 6.
- + Ovary ovoid or oblong-ovoid or broadly linear-cylindrical, a little attenuated or not attenuated toward the top, with a marked distinction between ovary and style (Plate XX, Figures 1b, 3b); herbaceous perennials with a short sometimes more or less woody caudex and broad (very rarely narrow or linear) spineless subradical leaves; peduncles nearly always few-jointed, solitary or in twos or threes, rarely in eights to tens 8.
6. Styles glabrous throughout 7.
- + Styles minutely bearded in lower half 1137. **Ikonnikovia** Lincz.
- 295 7. Leaves linear, rather narrow to subulate, rarely lanceolate or very rarely obovate; pulvinate or prostrate shrubs 1134. **Acantholimon** Boiss.
- + Leaves broadly obovate to oblong-spatulate; herbaceous perennials with a short woody caudex 1136. **Limoniopsis** Lincz.
8. Styles shaggy in lower part with rather long hairs 1138. **Goniolimon** Boiss.
- + Style glabrous throughout. 1139. **Cephalorrhizum** M. Pop. et Korov.

9. Corolla polypetalous from base; herbaceous perennials or suffrutescent plants. 10.
- + Corolla gamopetalous, with a fairly long tube and a 5-lobed limb; annual plants. 1142. *Psylliostachys* (Jaub. et Sp.) Nevski.
10. Flowers in compact spherical heads, borne singly at the end of simple leafless rather tall and erect peduncles 1140. *Armeria* Willd.
- + Flowers in single- to many-flowered spikes, borne more or less spicately (rarely subcapitately) on the branches of paniculate or corymbose-paniculate inflorescence 1141. *Limonium* Mill.

Subfamily I. **PLUMBAGINOIDEAE** Kuzn. in Mat. Fl. Kavk. IV, 1 (1902) 173.—Plumbagineae Lindl. Veg. Kingd. (1846) 641.—Plumbageae Meissn. Gen. (1840) 315; Boiss. in DC. Prodr. XII (1848) 690.—Characteristics described in the key.

Genus 1132. **PLUMBAGO** * L.

L. Sp. pl. (1753) 151.

Calyx tubular, commonly conical after anthesis, with 5 broad herbaceous ribs densely studded with large staked glands, scarious throughout between the ribs, 5-toothed at the top; corolla gamopetalous, the narrow tube greatly exceeding the calyx, the rotate limb 5-lobed; filaments of stamens distinct, concave-dilated at base; ovary oblong, the lower part of the style covered with rather long hairs; stigmas 5, filiform, covered on the inside
296 with large glands; fruit oblong-ovoid, rupturing at base and almost valvately dehiscing with upper part. Herbaceous perennials (in the USSR), subshrubs or shrubs (in the tropics); flowers large, subsessile, usually 3-bracted, in more or less oblong spiciform inflorescences, rose, azure, violet, or white.

The genus is known to contain about 15 species, mostly distributed through the tropics, of these one species growing wild in the USSR. Some of the foreign species are often cultivated as ornamentals in botanical gardens in southern areas of the USSR. Most common among these is the African *P. capensis* with large pale azure flowers and striking appearance. Another ornamental grown in botanical gardens is the Chinese *Ceratostigma plumbaginoides* Bge., often appearing under the wrong name *P. Larpentae* Lindl.

1. **P. europaea** L. Sp. pl. (1753) 151; Ldb. Fl. Ross. III, 471; Boiss. in DC. Prodr. XII, 691 et Fl. or. IV, 875; Kuzn. in Mat. Fl. Kavk. IV, 1, 174; Fedch. O and B. Perech. rast. Turk. 5, 192; Grossg. Fl. Kavk. ed. 1, III, 215.—*P. lapathifolia* Willd. Sp. pl. I, 2 (1797) 837; M.B. Fl. taur.-cauc. I, 144; III, 136.—*P. europaea* β. *Tournefortiana* Boiss. l.c. (primo).—*P. angustifolia* Spach, Veg. phan. X (1841) 337.—Ic.: Sibth. et Sm. Fl. Graeca. II, tab. 191; Rchb. Ic. Fl. Germ. XVII, tab. 1138.—Exs.: Sint. It. transcasp.-pers. 1900-1901, No. 1167; Fl. cauc. exs. No. 291 [sub. var. *lapathifolia* (Willd.) Woron.];

* From Latin *plumbum* = lead.

Kotschy, It. cilic.-kurd. 1859, No. 418; Billot, Fl. Gall. et Germ. exs. Nos. 2522, 2522 bis.

Perennial; stems herbaceous, erect, 30-100 cm long, branching in upper part or nearly from base; branches fairly numerous, more or less erect, slender, strict; leaves glaucescent, glabrous, rather sparsely and minutely lime-spotted, rather densely glandular-dentate on the margin to nearly smooth, the lowest short-petioled, the others sessile, auriculate and clasping at base, the lower and middle broadly elliptic or obovate to broadly lanceolate, much larger than the rest, sometimes 5-8 cm long and 3-4.5 cm broad; leaves on the upper part of the stem and on the branches much smaller, lanceolate or narrowly lanceolate to linear, becoming gradually smaller and finally passing into bracts; flowers in oblong or subcapitate spiciform inflorescences at the ends of branches, subsessile, each with (2) 3 bracteoles, these acutish, smooth or glandular on the margin, a quarter to one-third the length of the calyx; calyx 6-7 mm long and 1.5 mm in diameter, enlarging in fruit to 2.5-3 mm at base with 5 short triangular teeth, densely and almost regularly studded along the ribs with two rows of
297 large stalked glands; corolla violet-rose or rose, the tube half as long again to twice as long as the calyx, the lobes of the rotate limb obovate, obtusely truncate or round-tipped, with scarcely produced nerve terminations. Fl. August-September; fr. September-October.

Stony slopes and rocks in the lower and intermediate mountain zones, up to 1000 m. — Caucasus: E. and S. Transc.; Soviet Central Asia: Mtn. Turkm. (Kopet Dag Range), **Gen. distr.**: Med. (W. and E.), Bal.-As. Min., Arm.-Kurd., Iran. Described from southern Europe. Type in London.

Economic importance. A. A. Grossheim (Rastitel'nye resursy Kavkaza [Plant Resources of the Caucasus], 1946) points out (p. 351) that all parts of the plant are rich in tannins and are used in tanning. As regards medicinal use, he writes (in the chapter on plants in popular medicine, p. 192): "Particular attention should be drawn to leadwort, *Plumbago europaea*, which was widely used in Europe in the Middle Ages against ulcers, hemorrhoid swellings, scab, and cancerous disorders. According to A. Kh. Rollov, the plant is used in the Caucasus against toothache, and the root is employed in the treatment of rash and mange. The related tropical species *P. zeylanica* is used in the treatment of leprosy. A detailed scientific study of leadwort is needed".

Genus 1133. **PLUMBAGELLA*** SPACH**

Spach, in Hist. veg. phan, X (1841) 333, in nota.

Calyx tubular-conical, rigidly herbaceous, obscurely 5-angled, cleft to the middle into 5 acutely triangular segments with large stalked glands; corolla gamopetalous, 5-lobed, narrowly campanulate, slightly exceeding the calyx; stamens 5, attached at corolla base opposite its lobes; style filiform, 5-parted in upper part; fruit unilocular, with a thin membranous pericarp, splitting annularly at base and opening below with 5 valves, containing one seed. Annual herbaceous plants, with lanceolate amplexicaul and somewhat decurrent leaves.

* A diminutive form of *Plumbago*, the name of the systematically most closely related genus.

** Arranged by E. I. Shteinberg.

A monotypic genus, distributed in the USSR from northern Tien Shan to the Altai and Transbaikalia. Also occurring in Mongolia and China (Sinkiang Province and Tibet).

1. **P. micrantha** (Ledeb.) Spach in Hist. veg. phan. X (1841) 333; Boiss. in DC. Prodr. XII, 690; Kryl. Fl. Zap. Sib. 2152.— *Plumbago micrantha* Ledeb. Fl. alt. I (1829) 171; Ledeb. Fl. Ross. III, 471.— Ic.: Ledeb. 298 Ic. pl. Fl. Ross. I, tab. 21.— Exs.: GRF, Nos. 3050, 3455.

Annual, with a slender taproot, usually reddish in upper part; stem 20-50 cm long, 3- or 4-angled, with subsidiary angles between the main ones, often reddish, erect or ascending at base, branching nearly from base, the angles, especially in lower part, sparsely covered with thin horizontally spreading prickles; leaves 3-14 cm long and 1-3 cm broad, alternate, smooth on both sides, rather sparsely covered beneath with small calcareous dots, ovate-lanceolate, acuminate, entire, sessile, the cordate base clasping with lobes adnate to the stem; lowest leaves narrowed at base; flowers borne on very short pedicels, in threes to fives in the axils of bracts, forming a rather compact spiciform inflorescence 1-2.5 cm long—bracts resembling the cauline leaves but much smaller, the lower longer than the upper and about equaling the flowers; pedicels subtended by small oblong scarious bracteoles, these shorter than the calyx; calyx 4-4.5 mm long, the acutely triangular teeth as long as the tube, the ribs of the tube alternating with the teeth and forming flat rather blunt or rounded protruberances, these varying in number, either (a) one only, in upper part of the rib, (b) two, one in upper and one in lower part of the rib, or (c) two protruberances coalescing into a larger one; corolla about a quarter as long again as the calyx, narrowly campanulate, bluish-violet, the ovate acuminate lobes one-third as long as the tube; capsule blackish-brown, the valves united in upper part; seeds ovoid, pointed at the top, reddish-brown, ca. 3 mm long. July-August.

Derelict pastures and fallows, refuse dumps near human habitations, roadsides, stony mountain slopes (reported for the Trans-Ili Ala Tau in mountain-steppe juniper woods and stony taluses at an altitude of about 2300 m).— W. Siberia: Alt.; E. Siberia: Dau.; Soviet Central Asia: Dzu.-Tarb., T. Sh. **Gen. distr.:** Dzu.-Kash., Mong., Tib. Described from the Altai (in the vicinity of the village of Chechulikha on the Charysh River). Type in Leningrad.

Subfamily II. **STATICOIDEAE** Kusn. in Mat. Fl. Kavk. IV, 1 (1902) 176.— *Staticeae* Rchb. Consp. (1828) 91 et Fl. Germ. exc. (1831) 189; Boiss. in DC. Prodr. XII (1848) 621.— Characteristics described in the key.

301

Genus 1134. **ACANTHOLIMON*** BOISS.

Boiss. Diagn. pl. or. ser. I, VII (1846) 69.— *Armeriastrum* Jaub. et Sp., Ill. pl. or. I (1842-1843) 161, pro subgen. *Statice*.— *Armeriastrum* Ktze. Rev. gen. II (1891) 393, pro gen.

Calyx broadly or narrowly funnelform to sometimes nearly tubular, scarious, the 5 narrow or rarely fairly broad nerves herbaceous, glabrous

* From the Greek *acantha* = needle, and *leimon* = meadow, meadow grass.



Plate XVI

1. *Plumbago europaea* L., 1a) flower, 1b) ovary. 2. *Plumbagella micrantha* (Ldb.) Spach., 2a) flower, 2b) calyx with mature fruit. 3. *Acantholimon pterostegium* Bge., 3a) calyx with limb in section. 4. *A. bracteatum* (Girard) Boiss., 4a) calyx, 4b) ovary.

or rarely hairy within; calyx limb rather broad, with 5 or 10 lobes; base of calyx straight or oblique; corolla about twice the length of calyx; petals distinct except at base where connate into a ring or very rarely into a short cup, spreading at the tips, lower down forming a tube by overlapping of margins, rolling up inward when fading; filaments of stamens distinct except at base where adnate to petals or very rarely connate, more or less distinctly dilated in lower part, glabrous; styles distinct from base, glabrous; stigmas hemispherically or suboblongly capitate; ovary narrowly linear-cylindric or subovoid, attenuated upward and very gradually and imperceptibly passing into style; fruit oblong-linear, not enlarged at the top, opening with a small round lid and with valves. Shrubs, hemispherically or sometimes subspherically pulvinate or sprawling in flat mats with elongated branches; leaves commonly linear-triquetrous or subcylindric, subulate or acicular, rarely flat and fairly broad, nearly always prickly; flowers large, purple or red or pink or white (?), in single- to many-flowered sessile spicules, forming simple or compound panicles, the scapes fairly long or short and not exceeding the leaves.

The genus contains about 150 species, these mostly restrictedly endemic, distributed through southern Greece and the Island of Crete to W. Tibet, E. Tien Shan and Tarbagatai (including the Saur Range), confined to mountainous regions, in all altitude-zones, though chiefly in the intermediate and higher zones, nearly always in gravelly and stony soils and over exposed mountain rock layers. About 70 species occur in the USSR, mainly in Soviet Central Asia.

302 Note. Besides Boissier, who was the first to described the genus *Acantholimon* and many of its species and also provided its earliest classification, the systematics of this genus occupied the renowned Russian systematician A. A. Bunge who published in 1872 a very detailed monograph of the genus (Al. Bunge, *Die Gattung Acantholimon* Boiss. *Mem. Acad. Sc. Petersb.* 7 ser. XVIII, 2), including a systematic map of distribution areas of species. E. Regel described various new Soviet Central Asian species, while later additions were supplied by N. I. Kuznetsov (Caucasian species), E. P. Korovin and E. G. Chernyakovskaya (species of Soviet Central Asia and Iran). Particularly extensive studies of individual species were conducted by the late E. G. Chernyakovskaya who succeeded in publishing only a relatively small part of her herbarium investigations. The present work naturally includes, with the addition of descriptions, all the species proposed by Chernyakovskaya with which we could agree. As regards the general classification of the genus, none of the botanists mentioned made any attempt to introduce modifications on the basis of material which accumulated since the time of Boissier and Bunge. We have not, at this stage, made any substantial changes in the Boissier-Bunge classification, even though it is occasionally artificial. This would obviously require a new monographic revision of the genus.

In identifying species of *Acantholimon*, the following points should be borne in mind: (1) the size of cushions in descriptions of species is obviously mostly understated, due to the omission of dimensions on the labels and the fact that collectors selected such specimens (or parts of them) that would fit into a herbarium sheet; (2) purple or pink coloration of bracts and calyx may apparently change after long preservation to rusty or rusty-brown, the color sometimes indicated in the absence of fresh

specimens. It is therefore very important, while collecting new material, to note (and then copy on herbarium labels) dimensions (largest and smallest diameter) of cushions, length of scapes, as well as color of bracts, the calyx and its nerves, and petals. The length of scapes is invariably given together with inflorescence, this providing important information particularly in the case of species with short scapes. Spicule length is given from the base of the outer bract to the edge of the calyx limb. Petals are not taken into account, since in most cases their length can only be determined on live specimens. The relative length of the outer bract and the inner ones (in relation to one another and to the calyx) refers to the entire (not dismembered) spicule.

Economic importance. Species of the genus *Acantholimon* do not have any economic value, as so far they are not known to contain any useful substances. Because of the very prickly leaves, they are not eaten by livestock. Certain species can be used as ornamentals, on account of the unusual hemispherical growth habit.

1. Nerves of the calyx limb glabrous on the inside, narrow 2.
- + Nerves of the calyx limb hairy on the inside, very broad, abruptly
303 terminating about the middle of the limb (Plate XVI, Figure 3a); outer
bract ca. 10 mm long and broad, its scarious margin up to 3 mm broad
(Kopet Dag) 1. *A. pterostegium* Bge.
2. Outer bract ca. 10-12 mm long and broad, its scarious margin up to
3-4 mm broad and the herbaceous part relatively narrow; spikes large,
subspherically capitate, solitary at the ends of simple scapes
(Caucasus) 2. *A. bracteatum* (Girard) Boiss.
- + Outer bract much narrower, with a narrower scarious margin, the
herbaceous part relatively broad. 3.
3. Spring and summer foliage markedly different: summer leaves almost
subulate or acicular, very rigid and strongly spiny, nearly always
smooth-margined; spring leaves much shorter (one-fifth to half as long),
broad and flat, less rigid and less spiny, rather fleshy, early
marchescent and readily deciduous, the margin commonly ciliate-
scabrous. 66.
- + Spring and summer foliage fairly similar in shape and constitution;
summer leaves mostly rather distinctly applanate-triquetrous to quite
flat; spring leaves slightly shorter and broader than summer leaves,
persistent; the margin of both leaf types nearly always ciliate-scabrous
. 4.
4. Calyx subtubular (narrowly obconical), strongly oblique at base (Plate
XIX, Figure 1a) 70.
- + Calyx funnelform, straight at base 5.
5. Spicules 2-4-flowered, with more than 3 bracts, rarely in the upper
part of inflorescence single-flowered and 3-bracted 6.
- + All spicules single-flowered, with 3 bracts. 22.
6. Calyx limb white, rarely pink at base 7.
- + Calyx limb pink, purple, or dark purple 15.
7. Calyx 9-13 mm long; scapes greatly exceeding the leaves, averaging
10-15 and up to 25 cm in length. 8.
- + Calyx 5-8, rarely up to 10 mm long; scapes not exceeding the leaves
and if exceeding them then not more than 3-5 cm long, or the lower part
of scape undeveloped and spikes (or solitary spicules) sessile 9.

8. Calyx ca. 10-13 mm long, the limb ca. 4-5 mm broad; outer bract much shorter than the inner bracts and about equaling the calyx tube. 3. *A. tataricum* Boiss.
- 304 + Calyx ca. 9-11 mm long, the limb ca. 3 mm broad; outer bract slightly longer than the inner bracts, but greatly exceeding the calyx tube 4. *A. squarrosus* Pavl.
9. Lower part of scape undeveloped and spikes (or solitary spicules) sessile; leaves very small, 1-8 mm long 10.
- + Lower part of scape developed and spikes not sessile; leaves larger, up to 1.5-2 (3) cm long 11.
10. Leaves 4-8 mm long and ca. 1 mm broad, obtusely acuminate, muticous or rarely minutely mucronulate; 2- or 3-spiculed or spicules solitary 9. *A. Hedinii* Oestenf.
- + Leaves 1-3 (4) mm long and ca. 0.5-1 mm broad, round-tipped or obtusely acuminate, muticous; spicules solitary or in spikes of 2-3. 10. *A. diapensioides* Boiss.
11. Calyx tube densely hairy throughout (on and between the nerves). . . 12.
- + Calyx tube hairy only between the nerves 13.
12. Scapes greatly exceeding the leaves, up to 4-5 cm long; outer bract about half the length of calyx tube 7. *A. alaicum* Czerniak.
- + Scapes slightly exceeding the leaves, up to 1.5 cm long; outer bracts about equaling the calyx tube 8. *A. Borodinii* Krassn.
13. Leaves ca. 1 mm broad; spikes rather loose (Turkmenistan). 18. *A. Korovinii* Czerniak.
- + Leaves 1.5-3 mm broad; spikes compact (Pamir-Alai). 14.
14. Leaves up to 2-3 cm long; scapes 3-5 cm long 5. *A. lycopodioides* (Girard) Boiss.
- + Leaves up to 1 (or rarely 1.5) cm long; scapes up to 1.5 cm long. 6. *A. Zaprjagaei* Lincz.
15. Spikes rather dense and short (1.5-5 cm long) or spicules solitary and sessile, not exceeding the leaves 16.
- + Spikes rather loose (with distant spicules), up to 12 cm long 19.
16. Flowers usually in solitary sessile spicules ca. 7-8 mm long; leaves up to 5-8 mm long and ca. 1-1.5 mm broad 11. *A. tianschanicum* Czerniak.
- + Flowers in spikes containing 5-15 spicules; spikes always borne on rather long scapes; spicules 10-14 mm long; leaves 1-10 cm long and 2-5 (7) mm broad 17.
- 305 17. Leaves up to 5-10 cm long and 5-7 mm broad; scapes greatly exceeding the leaves, up to 10-20 cm long 12. *A. Alexandri* Fed.
- + Leaves up to 1.5-2 cm long and 3-4 mm broad; scapes barely exceeding the leaves, up to 2.5-3 cm long 18.
18. Leaves 3-4 mm broad; calyx 10-12 mm long. . . 13. *A. Fetissovi* Rgl.
- + Leaves 2-2.5 mm broad; calyx 8-9 mm long. . 14. *A. Ruprechtii* Bge.
19. Spikes very loose, the joints between spicules up to 2-3 times the spicule length; leaves ca. 1 mm broad (Kopet Dag). 17. *A. strictum* Czerniak.
- + Spikes rather more compact, the joints between spicules about half the length of to equaling the spicules; leaves up to 1.5-2 mm broad (Pamir-Alai and Tien Shan) 20.
20. Inner bracts greatly exceeding the calyx tube, sometimes reaching or even surpassing the middle of the limb; scapes always simple . . . 21.

- + Inner bracts slightly shorter than or nearly equaling the spicule; scapes 1- or 2-branched or simple 19. **A. pskemense** Lincz.
21. All bracts minutely hairy, the inner ones sometimes reaching up to the middle of the calyx limb, rather broadly winged-carinate on the back. 15. **A. compactum** Korov.
- + All bracts glabrous, the inner ones reaching or even surpassing the middle of the calyx limb, distinctly carinate but not winged on the back. 16. **A. Mikeschinii** Lincz.
22. Calyx limb pink or purple 23.
- + Calyx limb white or sometimes only the nerves tinged with purple . . 41.
23. Leaves always terminating in a distinct rather long point, spiny, linear-subulate to linear or rarely linear-lanceolate 24.
- + Leaves not distinctly point-tipped or terminating in a short point, scarcely spiny, linear-lanceolate to lanceolate or narrowly obovate. 20. **A. Ekatherinae** (B. Fedtsch.) Czerniak.
24. Spikes loose, with joints from slightly less than to 2-3 times the length of spicules, usually borne on the upper part of scape or on its branches. 25.
- + Spikes more or less compact or somewhat loose, 1.5-3 cm long, terminal on scape or on its branches, commonly rather distinctly 2-ranked. 34.
25. Leaves (except for the nearly always ciliolate-scabrous margin), and bracts glabrous 26.
- + Leaves (except the glabrous and merely rough-ciliolate-margined spring leaves), scapes (sometimes only at base) and bracts (nearly always) rather densely and minutely hairy 31.
26. Inner bracts about two-thirds the length of calyx tube 27.
- + Inner bracts about equaling the calyx tube 28.
27. Calyx 8-9 mm long; leaves (0.5) 1-1.5 cm long 26. **A. minshelkense** Pavl.
- + Calyx 12-13 mm long; leaves (1.5) 2-3.5 cm long. 27. **A. Margaritae** Korov.
28. Scapes 10-25 (50) cm long 29.
- + Scapes 5-10 cm long 30.
29. Calyx 10-11 mm long, the limb ca. 4-5 mm broad; scapes short-branched in upper part, rarely simple (Kopet Dagh) 21. **A. avenaceum** Bge.
- + Calyx 9-10 mm long, the limb ca. 3 mm broad; scapes rather long-branched in upper part or sometimes nearly from base (Tien Shan). 24. **A. aulieatense** Czerniak.
30. Leaves (1.5) 2-2.5 cm long, the spring leaves slightly shorter and scarcely broader; calyx limb dark purple (Tien Shan). 25. **A. purpureum** Korov.
- + Leaves (0.5) 1-1.5 cm long, the spring leaves markedly shorter and twice as broad; calyx limb pink or purple (Pamir-Alai) 30. **A. hissaricum** Lincz.
31. Leaves 0.5-1.5 cm long; scapes up to 10-15 cm long 32.
- + Leaves (1.5) 2-3.5 (up to 5-7) cm long; scapes 15-30 cm long 33.
32. Leaves on the average 0.5-1 cm long; scapes pubescent merely at base, simple; bracts glabrous 28. **A. nuratavicum** Zakirov.
- + Leaves on the average 1-1.5 cm long; scapes pubescent all the way up, short-branched in upper part; bracts hairy. 29. **A. Gontscharovii** Czerniak.

33. Scapes fairly short-branched in upper part, very rarely simple; inner bracts slightly shorter than to barely exceeding the calyx tube; spring leaves glabrous except for the ciliate-scabrous margin (Pamir-Alai).
 33. *A. Majevianum* Rgl.
- + Scapes commonly rather long-branched nearly from base, very rarely simple; inner bracts considerably exceeding the calyx tube, often reaching up to the middle of the limb; spring leaves densely hairy. (Kopet Dagh) 34. *A. gaudanense* Czerniak.
- 307 34. Leaves on the average 0.5-1 cm long (Kopet Dagh) 50. *A. blandum* Czerniak.
- + Leaves on the average 1-1.5 to 2-3.5 cm long 35.
35. Scapes considerably exceeding the leaves, up to 15-25 cm long ... 36.
- + Scapes not exceeding the leaves or only slightly, up to 5-8 (10) cm long. 37.
36. Cushions fairly compact; leaves glaucous; calyx 10-11 mm long (Kopet Dagh) 22. *A. khorassanicum* Czerniak.
- + Cushions very loose; leaves green or dark green; calyx 12-15 mm long (Pamir-Alai). 31. *A. saravschanicum* Rgl.
37. Leaves on the average 1-1.5 cm long. 38.
- + Leaves on the average 1.5-3.5 cm long. 39.
38. Cushions very loose; leaves (1) 1.5-2 mm broad; calyx 11-13 mm long. 32. *A. virens* Czerniak.
- + Cushions fairly loose; leaves ca. 0.5-1 mm broad; calyx 10 mm long. 37. *A. Varivtzevae* Czerniak.
39. Outer bract slightly shorter than the inner bracts; leaves ca. 0.5 mm broad 36. *A. langaricum* O. et B. Fedtsch.
- + Outer bract one-half to two-thirds the length of the inner bracts; leaves 1-1.5 mm broad 40.
40. Inner bracts equaling or slightly exceeding the calyx tube; leaves very rigid, strict, 2-3.5 (4) cm long; scapes 4-6 (10) cm long (Pamir-Alai). 35. *A. erythraeum* Bge.
- + Inner bracts considerably exceeding the calyx tube, reaching or surpassing the middle of the limb; leaves less rigid, 1.5-3 cm long; scapes 2-3 cm long (Kopet Dagh). 23. *A. procumbens* Czerniak.
41. Spikes loose, the joints slightly less than to 2-3 times the length of spicule; flowers borne on the upper part of the scape or on its branches. 42.
- + Spikes rather compact or fairly loose, small or moderately large (up to 2-4 cm long), terminal on the scape or on its branches, commonly rather distinctly 2-ranked 48.
42. Upper part of scape erect and firm 43.
- + Upper part of scape rather strongly flexuous and brittle (Caucasus). 44.
- 308 43. Outer bract about half as long as the inner bracts; calyx ca. 10-11 mm long, the limb ca. 4-5 mm broad (Tien Shan) 38. *A. laxum* Czerniak.
- + Outer bract slightly shorter than the inner bracts; calyx ca. 9-10 mm long, the limb ca. 3 mm broad (Caucasus) 39. *A. tenuiflorum* Boiss.
44. Leaves on the average 1.5-2.5 cm long. 45.
- + Leaves on the average 2.5-4 cm long. 47.

45. Calyx 13-14 mm long; summer leaves 1.5-2 mm broad, the spring leaves 3-4 mm broad 44. *A. armenum* Boiss. et Huet.
 + Calyx 9-11 mm long; summer leaves 1-1.5 mm broad, the spring leaves scarcely broader. 46.
46. Calyx limb ca. 2.5-3 mm broad, obscurely 10-lobed or subtruncate; scapes glabrous or in lower part very sparsely puberulous 40. *A. lepturoides* (Jaub. et Sp.) Boiss.
 + Calyx limb ca. 4 mm broad, distinctly 10-lobed; scapes sparsely and minutely puberulent to glabrate. 41. *A. Fominii* Kusn.
47. Leaves (except for the ciliolate-scabrous margin), scapes and bracts glabrous 42. *A. araxanum* Bge.
 + Leaves, scapes and the inner (and sometimes also the outer) bracts rather sparsely and minutely hairy . . . 43. *A. caryophyllaceum* Boiss.
48. Leaves on the average 0.5-1 cm, rarely up to 1.5 cm long. 49.
 + Leaves on the average 1.5-3 cm, sometimes up to 4.5 cm long. . . . 52.
49. Leaves rather densely covered with short hairs. 61. *A. Korolkovii* (Rgl.) Korov.
 + Leaves glabrous except on the ciliolate-scabrous margin 50.
50. Calyx 14-17 mm long, the limb 6-8 mm broad 62. *A. Knorringianum* Lincz.
 + Calyx 7-11 mm long, the limb ca. 4 mm broad 51.
51. Calyx 7-9 mm long; inner bracts considerably exceeding the calyx tube (Pamir-Alai). 64. *A. Komarovii* Czerniak.
 + Calyx 10-11 mm long; inner bracts about equaling the calyx tube. 46. *A. schemachense* Grossh.
52. Scapes considerably exceeding the leaves, 15-25 (40) cm long 53.
 + Scapes not more than 15 cm long. 54.
53. Calyx 10-12 mm long, the limb ca. 5 mm broad (Kopet Dagh) 51. *A. Raddeanum* Czerniak.
 + Calyx 7-8 (10) mm long, the limb ca. 3-4 mm broad (Pamir-Alai). 63. *A. parviflorum* Rgl.
54. Scapes glabrous 55.
 + Scapes rather densely puberulous 57.
55. Inner bracts considerably exceeding the calyx tube, sometimes reaching up to the middle of the limb (Kopet Dagh) 49. *A. pulchellum* Korov.
 + Inner bract about equaling the calyx tube 56.
56. Outer bract about one-half to two-thirds the length of the inner bracts; calyx 12-14 mm long (Caucasus) . . 48. *A. sahendicum* Boiss. et Buhse.
 + Outer bract about one-third to one-half the length of the inner bracts; calyx 10-11 mm long (Pamir) 55. *A. pamiricum* Czerniak.
57. Outer and inner bracts terminating in a slender cusp 1-2 mm long. 58.
 + The cusp of outer and inner bracts not exceeding 0.5 mm or very short and barely discernible. 61.
58. Outer bract scarcely shorter than or about equaling the inner bracts (Caucasus) 47. *A. glumaceum* (Jaub. et Sp.) Boiss.
 + Outer bract one-half to two-thirds the length of the inner bracts (Tien Shan) 59.
59. Cushions loose, often with long procumbent branches; leaves on the average 2-3 (up to 4) cm long and ca. 1-1.5 (2) mm broad; calyx 12-14 mm long 58. *A. Albertii* Rgl.

- + Cushions compact or fairly compact; leaves on the average 1-2 (up to 2.5) cm long and ca. 0.3-1 mm broad; calyx 9-12 mm long 60.
- 60. Leaves ca. 0.3-0.5 mm broad; inner bracts about two thirds as long as the calyx tube 59. **A. karatavicum** Pavl.
- + Leaves ca. 0.5-1 mm broad; inner bracts about equaling or somewhat exceeding the calyx tube 60. **A. Titovii** Lincz.
- 61. Leaves rather densely short-hairy 62.
- + Leaves glabrous except the ciliolate-scabrous margin 63.
- 62. Leaves bright green, ca. 0.5 mm broad; scapes rather considerably exceeding the leaves, 4-8 cm long 56. **A. kokandense** Bge.
- + Leaves grayish-green, 1-1.5 mm broad; scapes scarcely or slightly exceeding the leaves, 3-5 cm long 57. **A. velutinum** Czerniak.
- 310 63. Scapes scarcely or slightly exceeding the leaves, 3-6 cm long, always simple 52. **A. alatavicum** Bge.
- + Scapes rather considerably exceeding the leaves, up to 10-15 cm long, with 1-3 short branches at the top 64.
- 64. Leaves on the average 1.5-2 cm long, glaucous-green or pale green; nerves of the calyx limb hairy outside in lower part (Caucasus) 45. **A. Hohenackeri** (Jaub. et Sp.) Boiss.
- + Leaves on the average 2-3 (up to 4) cm long, bright green or pale green; nerves of the calyx limb glabrous (Soviet Central Asia). 65.
- 65. Leaves ca. 0.5-1 mm broad, moderately rigid; nerves of the calyx limb distinctly excurrent (Tarbagatai) 53. **A. tarbagataicum** Gamajun.
- + Leaves ca. 1-1.5 mm broad, rigid; nerves of the calyx limb not quite or only just reaching the margin (Tien Shan). 54. **A. Sackenii** Bge.
- 66. Calyx subtubular (narrowly obconical), the limb narrow (Plate XVIII, Figures 3a, 4a). 67.
- + Calyx funnelform, with a broad limb (Plate XVIII, Figure 5a) 69.
- 67. Calyx 14-15 mm long; leaves rather uniformly ciliate-scabrous on the margin (Badkhyz) 67. **A. Nikitinii** Lincz.
- + Calyx 8-11 mm long; leaves smooth-margined (Caucasus) 68.
- 68. Calyx ca. 9-11 mm long; the limb 2-3 mm broad, more or less acutely lobed, the nerves passing through the main lobes 65. **A. Karelinii** (Stschegl.) Bge.
- + Calyx ca. 8-9 mm long, the limb 1.5-2 mm broad, obtusely lobed or subtruncate, the nerves passing between the lobes (Plate XVIII, Figure 4a) 66. **A. quinquelobum** Bge.
- 69. Calyx limb white; leaves 1.5-3 (4.5) cm long. 68. **A. balchanicum** Korov.
- + Calyx limb pink or purple; leaves 1-1.5 (2) cm long. 69. **A. erinaceum** (Jaub. et Sp.) Lincz.
- 70. All scapes simple; spikes very loose and long; the nerves of the calyx tube densely covered throughout with long hairs. 70. **A. mirandum** Lincz.
- + Scapes paniculately short-branched in upper part, rarely simple; spikes rather dense, short, terminal; nerves of the calyx tube sparsely long-hairy merely in lower part 71. **A. mirum** Lincz.

Section 1. **PTEROSTEGIA** Bge. in Mem. Acad. Sc. Petersb. VII ser. XVIII, 2 (1872) 15; Boiss. Fl. or. IV (1879) 826. — Spicules 2-5-flowered, in large subspherical or nearly oblong spikes, these borne at the end of simple or terminally scarcely branched scapes; outer bracts large, very broad, broadly scarious-margined; calyx funnelform, straight at base; nerves of the calyx limb very broad and hairy on the inside; all leaves scabrous-margined.

1. **A. pterostegium** Bge. in Mem. Acad. Sc. Petersb. VII ser. XVIII, 2 (1872) 15; Boiss. Fl. or. IV, 826. — *A. cymosum* O. et B. Fedtsch. Perech. rast. Turk. 5 (1913) 187 et auct. turk. plur. non Bge. — Ic.: Korov. Rast. Sr. Azii, Fig. 185. — Exs.: Sintenis, It. transcasp.-pers. 1900-1901, No. 548 (sub *A. cymosum* Bge.).

Frutescent plants; cushions commonly loose, fairly tall (subhemispherical) or more or less sprawling, 15-40 cm in diameter; leaves glaucous or greenish-glaucous, subobtusely triquetrous-subulate, rigid, (2.5) 3-4 (6) cm long and ca. 1-1.5 mm broad, acerose, glabrous, the margin minutely ciliate-scabrous (sometimes almost exclusively at base); spring leaves (at the base of annual shoots) markedly shorter and less rigid, more densely ciliate-scabrous on the margin; scapes barely exceeding the leaves, simple or scarcely branched at the top, rather densely puberulous at the end and more sparsely so lower down or glabrous; spikes terminal, subspherical or more often oblong-declinate, large, up to 4-6 cm long and 1.5 cm broad, compact, obscurely 2-ranked; spicules ca. 10 mm long, 2-4 (5)-flowered; outer bract ca. 10 mm long and broad, equaling the calyx and the nearest inner bracts, irregularly rounded-cordate, rigidly herbaceous in middle part, rather densely long-hairy on both sides, the scarious margin up to 3 mm broad, the innermost bracts much smaller; calyx ca. 8-9 mm long, broadly funnelform; calyx tube ca. 5 mm long, densely covered throughout with rather long hairs; calyx limb ca. 3-4 mm broad, white, rather distinctly 5-lobed, the nerves broad and thick, gradually narrowing upward and abruptly terminating at about the middle of the limb, covered on both sides with rather long hairs; petals pale pink or white (?). Fl. May-June (Plate XVI, Figures 3, 3a).

Stony and fine-earth stone-covered slopes in the lower and intermediate mountain zones, at altitudes of 600-1200 (1600) m. — Soviet Central Asia: Mtn. Turkm. (Centr. and W. Kopet Dag). **Gen. distr.:** Iran (N. Khurasan). Described from the Meshed area. Type in Leningrad.

Section 2. **ARMERIOPSIS** Boiss. Diagn. ser. 1, VII (1846) 70 et in DC. Prodr. XII (1848) 622 et Fl. or. IV (1879) 827; Bge. in Mem. Acad. Sc. Petersb. VII ser. XVIII, 2, 16. — Spicules 2-5-flowered; spikes large, subspherically capitate, solitary at the ends of simple scapes; outer bracts large, very broad and broadly scarious-margined; calyx funnelform, straight at base; nerves of calyx limb narrow, glabrous on the inside; all leaves scabrous-margined.

2. **A. bracteatum** (Girard) Boiss. Diagn. ser. 1, VII (1846) 70 et in DC. Prodr. XII, 622 et Fl. or. IV, 827. — *A. splendidum* Bge. in Mem. Acad. Sc. Petersb. VII ser. XVIII, 2 (1872) 17; Grossg. Oprod. rast.

Kavk. 592.—*A. bracteatum* [var.] β . *splendidum* Boiss. Fl. or. IV (1879) 827; Kuzn. in Mat. Fl. Kavk. IV, 1 (1902), 179; Grossg. Fl. Kavk. ed. 1, III (1932) 215.—*Statice bracteata* Girard in Ann. sc. nat. 3 ser. bot. II (1844) 330.—Exs.: Aucher, Herb. or. No. 5242 (typus!).—

Frutescent plants; cushions rather compact and tall (subhemispherical), 10-15 cm in diameter; leaves glaucescent-green or glaucous, applanate-triquetrous or nearly flat, 3-6 cm long and 1.5-2 mm broad, acerose, glabrous, the margin densely ciliolate-scabrous; spring leaves (at the base of annual shoots) much shorter and slightly broader, less rigid; scapes barely exceeding or rather considerably exceeding the leaves, 6-18 cm long, simple, sparsely and minutely puberulous or glabrous; spikes terminal subspherically capitate, ca. 2-2.5 cm in diameter, compact, solitary; spicules ca. 15 mm long, 2-5-flowered; outer bract ca. 10-12 mm across, slightly exceeding the calyx tube and about equaling the nearest inner bracts, very broadly rounded-ovate to suborbicular, glabrous throughout, commonly terminating in a very short and rigidly herbaceous point, the scarious margin up to 3-4 mm broad; innermost bracts much shorter; calyx ca. 12-13 mm long, rather broadly funnelform, the tube ca. 7-8 mm long, sparsely pubescent or glabrous except for isolated hairs, the limb ca. 5 mm broad, pink or purple, obscurely 5-lobed, subtruncate, the nerves narrow, reaching the margin, glabrous or rather densely hairy in lower part, dark purple; petals bright pink. Fl. May-June (Plate XVI, Figures 4, 4a, 4b).

Stony slopes in the intermediate and higher mountain zones.—Caucasus: S. Transc. **Gen. distr.**: Arm.-Kurd., Iran, (NW part). Described from Iran (in the vicinity of the village of Seid-Khadzhi). Type in Paris.

Section 3. **GLUMARIA** Boiss. em. Bge. in Mem. Acad. Sc. Petersb. VII ser. XVIII, 2 (1872) 18.—Sect. *Glumaria* Boiss. in DC. Prodr. XII (1848) 623 et Fl. or. IV (1879) 828, mutatis charact.—Sect. *Pulvinaria* Boiss. Fl. or. IV (1879) 830; Chernyak. in Tr. Bot. inst. AN SSSR, ser. I, 3, 257.—Spicules (1) 2-4-flowered; spikes rather distinctly 2-ranked, short
313 (sometimes sessile) or suboblong and loose, borne on simple or rarely few-branched scapes; outer bracts fairly broad and rather broadly scarious-margined; calyx funnelform, straight at base; all leaves scabrous-margined, very rarely smooth-margined; spring and summer leaves alike, commonly rather flat and relatively broad.

3. ***A. tataricum*** Boiss. in DC. Prodr. XII (1848) 623 et Fl. or. IV (1879) 829; Bge. in Mem. Acad. Sc. Petersb. VII ser. XVIII, 2, 20; Fedch. O. and B. Perech. rast. Turk. 5, 187; Chernyak. in Tr. Bot. Sada, XLIV 93.—*A. Iskanderi* Lipsky ex O. et B. Fedtsch. l.c. 190, nomen, p.p. excl. specim. karatavica; Chernyak. l.c. 93, pro syn.

Frutescent plants; cushions rather compact, tall (subhemispherical), 10-30 cm in diameter; leaves glaucous or greenish-glaucous, flat, narrowly linear-lanceolate or triangular-lanceolate or linear, rigid, (1) 1.5-2.5 (4) cm long and 1-2 (3) mm broad, short-acerose, glabrous or minutely puberulous, the entire margin ciliolate-scabrous; scapes considerably exceeding the leaves, 10-15 (25) cm long, simple or very seldom scarcely branched (with a single short branch), rather densely covered with very short hairs; spikes terminal, 3-5 (8) cm long, 5-10-spiculed, fairly dense,

rather distinctly 2-ranked in upper part, usually interrupted below; spicules 12-15 mm long, 2-3 (4)-flowered, the outer flower borne on a longer pedicel sometimes up to 3 mm long; outer bract 7-11 mm long, usually markedly shorter than the inner bracts and about equaling the calyx tube, oblong-ovate, long-acuminate, terminating in a fairly long straight cusp, rather narrowly scarious-margined, glabrous; the two nearest inner bracts glabrous, markedly exceeding the calyx tube and usually reaching the middle of the limb, the mucro often dorsal, the scarious margin very broad; innermost bracts slightly exceeding the calyx tube, scarious, the nerve narrow, very narrowly and sharply winged, sparsely ciliolate or bare, dorsally mucronate; calyx 10-13 mm long, funnelform, the tube ca. 6-8 mm long, rather densely covered between the nerves with long hairs; calyx limb 4-5 mm broad, white, obscurely lobed to subtruncate, the purple nerves bare or barely scarcely pubescent in lower part, reaching the margin or very nearly so; petals bright pink. Fl. July-August (Plate XVII, Figures 1, 1a).

Stony mountain slopes, often in wormwood and wormwood-grass associations, at altitudes of 1500-2500 m. — Soviet Central Asia: Pam.-Al. (NW part: Gissar Range (N. slopes), Zeravshan and Turkestan ranges and Mal'guzar Mts., Nuratau). Endemic. Described from plants collected by Leman in the Zeravshan River basin. Type in Geneva (?); cotype in Leningrad.

- 314 4. **A. squarrosus** Pavl. in Vestn. Akad. Nauk Kazakhsk. SSR, 1 (1949) 36. — A. Iskanderi Lipsky ex O. et B. Fedtsch. Perech. rast. Turk. 5 (1913) 190, nomen, p.p. quoad specim. karatavica.

Rather compactly pulvinate subhemispherical shrubs 10-30 cm in diameter; leaves glaucous or greenish-glaucous, flat, narrowly linear-lanceolate or linear, rigid, (1) 1.5-2 (3.5) cm long and 1-2 (3) mm broad, short-acerose, glabrous, sparsely and minutely ciliolate-scarious or nearly smooth on the margin; scapes considerably exceeding the leaves, 6-20 cm long, simple, rather densely and minutely puberulous; spikes terminal, 2-3 (6) cm long, rather densely 5-7 (10)-spiculed, rather distinctly 2-ranked toward apex, commonly interrupted in lower part; spicules ca. 10-12 mm long, 2- or 3-flowered; bracts all glabrous; outer bract ca. 9-10 mm long, usually somewhat shorter than the inner bracts and rather markedly exceeding the calyx tube, oblong-ovate, rather long-acuminate, the mucro short and straight, the scarious margin rather narrow; the first two inner bracts considerably exceeding the calyx tube, reaching up to or above the middle of the limb, dorsally and minutely mucronulate, the scarious margin very broad; innermost bracts only slightly shorter than the other, scarious, the midrib narrow, very narrowly and sharply winged, subapically and minutely mucronulate; calyx 9-11 mm long, funnelform, the tube ca. 7-8 mm long, rather densely covered between the nerves with long hairs; calyx limb ca. 3 mm broad, white, obscurely lobed to subtruncate, the purple nerves bare or rarely scarcely pubescent in lower part, reaching the margin; petals pink. Fl. July-August.

Stony mountain slopes, at altitudes of 1500-1800 m. — Soviet Central Asia: Tien Shan (Karatau Range). Endemic. Described from the Minzhelke upland area. Type in Alma Ata.

5. **A. lycopodioides** (Girard) Boiss. in DC. Prodr. XII (1848) 632; Bge. in Mem. Acad. Sc. Petersb. VII ser. XVIII, 2, 20, descr. emend.; Hook. Fl. Brit. Ind. III, 479; Fedch. O. and B. Perech. rast. Turk. 5, 187; Pampanini, Fl. del Caracorum (1930) 169, an p.p. excl. specim. nonn. ?; Linch. in Bot. Mat. Gerb. Bot. inst. AN SSSR, XIV (1951) 278. — *Statice lycopodioides* Girard in Ann. sc. nat. 3 ser. II (1844) 330, excl. syn. Willd. — *A. tibeticum* Hook. f. et Thoms. ex Bge. l.c. 20, nomen, pro syn.

315 Rather compactly pulvinate subhemispherical shrubs, 10-30 cm in diameter; leaves glaucous or greenish-glaucous, flat, linear-lanceolate to linear, rigid, (1) 1.5-2 (3) cm long and (1) 1.5-2 (3) mm broad, short-acerose, glabrous or rarely covered with very short hairs, the margin rather sparsely and minutely ciliate-scabrous throughout or nearly smooth; scapes about equaling or slightly exceeding the leaves, 3-5 cm long, simple, densely and minutely puberulous; spikes terminal, small, 1.5-2 cm long, rather compactly 5-8-spiculed, usually distinctly 2-ranked; spicules ca. 10 mm long, 2- or 3-flowered, the outer flower commonly borne on a longer pedicel (ca. 1 mm long); outer bract ca. 4-5 mm long, markedly shorter than the inner bracts, shorter than to sometimes nearly equaling the calyx tube, irregularly and broadly ovate, rather short-acuminate, usually minutely puberulous, terminating in a short straight mucro, the scarious margin rather narrow; the first two inner bracts usually markedly longer than the calyx tube, sometimes reaching the middle of the limb, commonly minutely puberulous, the mucro very short sometimes arising only just below the apex; innermost bracts equaling the calyx tube, scarious, the midrib narrow, sharply carinate, commonly sparsely ciliate, sometimes minutely and dorsally mucronulate; calyx 6-8 (10) mm long, funnellform, the tube ca. 4-5 mm long, densely covered with short-hairs between the nerves or rarely glabrate; calyx limb ca. 2-3 (5) mm broad, white (sometimes pink?), obscurely lobed to subtruncate, the purple nerves nearly reaching the margin, rather densely and minutely hairy or glabrate; petals pink or pale pink (nearly white?). Fl. July-August.

Rocks and stony mountain slopes, often in wormwood associations, at altitudes of 1500-2500 (4000) m. — Soviet Central Asia: Pam.-Al. (W. and S. Pamir). **Gen. distr.:** Iran. (Afghanistan), Ind.-Him. (N.), Dzu.-Kash. (extreme S.). Described from the upper part of the Indus River basin. Type in Vienna; cotype in Leningrad.

Note. The species, as presented here, has a very wide compass, and the material (especially from W. Pamir) needs further study.

6. **A. Zaprjagaevii** Lincz. sp. n. in Addenda XVII, 732.

316 Compactly pulvinate low shrubs, 10-20 cm in diameter; leaves glaucous or glaucescent-green, flat, lanceolate to broadly lanceolate, rigid, 5-8 (15) mm long and (1.5) 2-2.5 mm broad, gradually attenuate at apex, short-acerose, glabrous or scarcely and minutely hairy, the entire margin ciliate-scabrous; scapes slightly exceeding the leaves, up to 1.5 cm long; simple, densely puberulous; spikes terminal, subcapitate, ca. 1 cm long, densely 3-5-spiculed; spicules ca. 8 mm long, 2- or 3-flowered; bracts glabrous or rarely minutely hairy; outer bract ca. 5 mm long, markedly shorter than the inner bracts, about equaling the calyx tube, irregularly and broadly ovate to subrhomboid, acuminate-mucronulate, the scarious margin rather narrow; inner bracts markedly exceeding

the calyx tube, very broadly scarious-margined or scarious, narrow-ribbed, minutely mucronulate; calyx ca. 8 mm long, funnelform, the tube sparsely and irregularly hairy; calyx limb rather distinctly 10-lobed or subtruncate, the purple nerves rather densely hairy in lower part or bare, nearly reaching the margin; petals bright pink. Fl. July (Plate XVII, Figures 2, 2a).

Rocks and stony slopes in the alpine zone. — Soviet Central Asia: Pam.-Al. (S. Darvaz area). **Gen. distr.:** ? Iran. (NE Afghanistan). Described from Mt. Kugi-Frush. Type in Leningrad.

Note. A species kindred to *A. lycopodioides* (Girard) Boiss., from which it differs distinctly in the shorter (on the average half as long) and broader leaves and the subsessile spikes. The cycle also includes *A. Alexeenkoanum* Czerniak. which has been scheduled (in herb.) for further study.

7. ***A. alaicum*** Czerniak. sp. nov. in Addenda XVII, 732.

Compactly pulvinate subhemispherical to hemispherical shrubs, 10-15 cm in diameter; leaves glaucous or glaucescent-green, flat or scarcely triquetrous, linear, somewhat rigid, (5) 8-10 (15) mm long and ca. 1.5 mm broad, rounded-obtuse or acutish and obsoletely or fairly distinctly mucronate, glabrous, the margin minutely ciliate-scarious merely at base; scapes greatly exceeding the leaves, up to 4-5 cm long, simple, densely puberulous; spikes terminal, ca. 1-1.5 cm long, fairly densely 4-7-spiculed, indistinctly 2-ranked or unilateral; spicules ca. 7-8 mm long, (1) 2- or 3-flowered; bracts all glabrous; outer bract ca. 3 mm long, about half as long as the inner bracts and the calyx tube, irregularly and broadly rhomboid, acuminate-mucronulate, rather broadly scarious-margined; inner bracts slightly exceeding the calyx tube, very broadly scarious-margined or scarious throughout except for the narrow midrib, minutely mucronulate or muticous; calyx ca. 7-8 mm long, funnelform, the tube ca. 4-5 mm long, densely hairy throughout on and between the nerves; calyx limb ca. 3 mm broad, white, obscurely 10-lobed to subtruncate, the nerves distinctly terminating below the margin, densely hairy in lower part; petals pink. Fl. July.

Mountain valleys, in sandy soil, at altitudes of 2500-3500 m. — Soviet Central Asia: Pam.-Al. (Alai Valley). Endemic. Described from the Alai Valley. Type in Leningrad.

317 **Note.** Apparently a species of the *A. Borodinii* Krassn. group, distinguished by the strongly developed scapes, the much shorter outer bracts, and some other characteristics.

8. ***A. Borodinii*** Krassn. Spisok rast. sobr. v vostochn. Tyan'-Shane letom 1886 g. [List of plants collected in eastern Tien Shan during the summer of 1886] (1887) 96, 128 ("Borodini"); Fedch. O. and B. Perech. rast. Turk. 5, 188; Chernyak. in Tr. Bot. inst. AN SSSR, ser. I, 3 (1937) 266. — *A. Rhoborowskii* Czerniak. l.c. 267. — Ic.: Chernyak. ibid., Figures 5, 6.

Compactly pulvinate, subhemispherical to hemispherical shrubs, 50-100 cm in diameter; leaves glaucescent-green, applanate-triquetrous to nearly flat, linear-lanceolate to linear, rigid, 5-10 (12) mm and ca. 1 mm broad, gradually acuminate and cuspidate, glabrous, sometimes

minutely ciliate-scabrous at the very base; scapes but slightly exceeding the leaves, up to 1.5 cm long, simple, rather densely puberulous; spikes ca. 1 cm long, densely 3-7-spiculed, rather distinctly 2-ranked; spicules ca. 8-9 mm long, 1-2-flowered; bracts glabrous or more or less densely covered with short hairs; outer bract ca. 4 mm long, much shorter than the inner bracts and about equaling the calyx tube, ovate to oblong-ovate, gradually acuminate, mucronate, rather narrowly scarious-margined; inner bracts greatly exceeding the calyx tube, very broadly scarious-margined or scarious throughout except for the narrow midrib, sublanceolate, gradually pointed at apex, nearly always mucronate, calyx ca. 7-8 mm long, funnelform, the tube ca. 4 mm long, densely covered throughout with short hairs on and between the nerves; calyx limb ca. 3-4 mm broad, white, distinctly 10-lobed, the main lobes fairly large and broadly triangular, the nerves rather densely hairy and usually distinctly excurrent; petals pink. Fl. July-August.

Stony fine-earth mountain slopes in the alpine zone. — Soviet Central Asia: Tien Shan (SE part). **Gen. distr.:** Dzu.-Kash. (S. part, areas adjoining Central Tien Shan). Described from the Bedel' Pass area. Type in Leningrad.

9. **A. Hedinii** Ostenf. in Hedin, South. Tibet, VI, 3 (Ostenfeld and Paulsen, A list of flower plants from inner Asia) (1922) 48; Chernyak. in Tr. Bot. inst. AN SSSR, ser. I, 3, 260; Stanyukovich, Rastit. pokrov. vost. Pamira [Plant cover of East Pamir], 61. — *A. diapensioides* var. *longifolia* O. Fedtsch. in Tr. Bot. Sada, XXI (1903) 407; Ostenf. l.c. 49. — Ic.: Ostenf. l.c. pl. IV, f. 2; Chernyak. l.c., Figure 2.

318 Very compactly pulvinate, subhemispherical to hemispherical shrubs, up to 20-40 (70) cm in diameter; leaves glaucous-green, applanate-triangular to nearly flat, narrowly lanceolate to linear, rather rigidly fleshy, 4-8 mm long and ca. 1 mm broad, obtusish, muticous or rarely minutely mucronulate, glabrous, the margin minutely ciliate-scabrous; spikes sessile, greatly exceeding the leaves, loosely 2- or 3-spiculed or solitary 1- or 2-flowered and ca. 7-8 mm long; bracts all glabrous, rather broadly round-tipped; outer bract ca. 2.5-3 mm long, about half as long as the inner bracts, broadly and irregularly ovate, subapiculate-mucronulate, the scarious margin fairly broad; inner bracts slightly exceeding the calyx tube, very broadly scarious-margined or scarious throughout except for the narrow midrib, minutely apiculate-mucronulate or muticous; calyx ca. 7-8 mm long, funnelform, the tube ca. 3-4 mm long, rather densely hairy on and between the nerves or glabrous; calyx limb ca. 3-4 mm broad, white or at base pinkish, obscurely 10-lobed to subtruncate, the nerves commonly bare, reaching the margin or nearly so or rarely scarcely excurrent; petals bright pink. Fl. July-September.

Stony fine-earth mountain slopes in the alpine zone. — Soviet Central Asia: Pam.-Al. (E. Pamir and the Alai Valley area). **Gen. distr.:** Dzu.-Kash. (S. part, areas adjoining Pamir). Described from the eastern shore of Lake Malye Karakul'. Type in Copenhagen (?).

Note. A critical species; its small-leaved forms closely resembling *A. diapensioides* Boiss. and long-leaved forms approaching *A. Borodinii* Krassn. Further studies of this group of species are needed, with more extensive material.

10. **A. diapensioides** Boiss. in DC. Prodr. XII (1848) 624 et Fl. or. IV (1879) 830; Bge. in Mem. Acad. Sc. Petersb. VII ser. XVIII, 2 (1872) 21, p.p. quoad specim. afghan.; Fedch. O and B. Perech. rast. Turk. 5, 188; Raikova in Tr. SAGU, ser. VIII b, 12, 7; Chernyak. in Tr. Bot. inst. AN SSSR, ser. I, 3, 258; Zalenskii in Bot. zhurn. XXXIII, 6, 573; Stanyukovich, Rastit. pokrov vost. Pamira, 62.—Ic.: Raikova, l.c. Fig. 4; Chernyak. l.c., Fig. 1; Zalenskii, l.c., Fig. 1; Stanyukovich, l.c. 56, 112,

Very compactly pulvinate shrubs, up to 30-60 (120) cm in diameter, young fairly tall to subhemispherical, in age rather flat, the oldest usually with dead central part; leaves glaucous or glaucescent-green, applanate-triangular with bluntish angles, triangular-lanceolate to sublinear, fairly rigidly fleshy, very small, 1-3 (4) mm long and ca. 0.5-1 mm broad, round-tipped or obtuse, mucous, glabrous, the margin minutely ciliate-scabrous at the very base and smooth elsewhere; spikes sessile, greatly
319 exceeding the leaves, loosely 2-3-spiculed, or more often spicules solitary, 1- or 2-flowered, ca. 6-7 mm long; bracts all glabrous, rather broadly round-tipped; outer bract ca. 2-3 mm long, about two-fifths to one-half as long as the inner bracts, broadly and irregularly ovate, minutely apiculate-mucronulate, rather narrowly scarious-margined; inner bracts slightly exceeding the calyx tube, sometimes nearly reaching the middle of the limb, very broadly scarious-margined or scarious throughout except for the narrow midrib, apiculate-mucronulate; calyx ca. 5-6 (7) mm long, funnelform, the tube ca. 2.5-3 (4) mm long, between the veins scarcely hairy, the tube ca. 2.5-3 mm broad, white or at base pinkish, obscurely 10-lobed to subtruncate, the bare nerves reaching or nearly reaching the margin; petals more or less bright pink, Fl. July-September (Plate XVII, Figures 3, 3a).

Stony fine-earth mountain slopes in the alpine zone.—Soviet Central Asia: Pam.-Al. (E. Pamir). **Gen. distr.:** Iran. (E. Afghanistan), Dzu.-Kash. (S. part, areas adjoining Pamir). Described from Afghanistan (Koh-i-Baba Range), according to Griffith. Type in London; isotypes in Geneva and Leningrad.

Note. This species is presented here according to the original narrow conception of Boissier (apparently with the sole omission of the indication concerning the red coloration of the calyx limb) and not in accordance with Bunge who includes here (while pointing out certain differences) samples from Tien Shan, with larger acute leaves and purple calyx, that have recently been separated as a distinct species.—*A. tianschanicum* Czerniak. The interrelationships between *A. diapensioides* Boiss. and *A. Hedinii* Ostenf. are as yet insufficiently clear to me; it is possible that the latter species (or, at least, its small-leaved form) represents merely an ecological form of *A. diapensioides* (associated with better soil moisture supply; see: Stanyukovich, l.c. 61). A number of interesting data concerning the biology and ecology of *A. diapensioides* Boiss. are to be found in the above-mentioned studies by Raikova, Zalenskii, and Stanyukovich.

11. **A. tianschanicum** Czerniak. in Tr. Bot. inst. AN SSSR, ser. I, 3 (1937) 262.—*A. diapensioides* Herder in Bull. Soc. Nat. Mosc. XVI (1868) 394; non Boiss.; Bge. in Mem. Acad. Sc. Petersb. VII ser. XVIII, 2, 21, p.p. quoad specim. tiansch.—*A. diapensioides* var. (an spec. nova?) Fedch. O. and B. Perech. rast. Turk. 5, 188.—Ic.: Chernyak. l.c. Figure 3.

Compactly pulvinate, fairly tall to subhemispherical shrubs, up to 20-30 cm in diameter; leaves glaucous or glaucous-green, applanate-triquetrous to nearly flat, triangular-lanceolate to sublinear, fairly rigid, 3-5 (8) mm long and ca. 1-1.5 mm broad, commonly gradually acuminate, minutely but distinctly mucronulate, rarely obtusish and muticous, glabrous, the margin rather densely ciliolate-scabrous to nearly smooth; spicules solitary, commonly greatly exceeding the leaves, ca. 7-8 mm long, 1- or 2-flowered; bracts all glabrous; outer bract ca. 2-2.5 mm long, about half as long as the inner bracts, broadly and irregularly ovate, apiculate-mucronulate, rather narrowly scarious-margined; inner bracts greatly exceeding the calyx tube, nearly reaching the middle of its limb, very broadly scarious-margined or scarious throughout except for the narrow midrib, mucronulate; calyx ca. 7-8 mm long, funnellform, the tube ca. 3-4 mm long, very sparsely hairy between the nerves or glabrous; calyx limb ca. 3-4 mm broad, purple or dark purple, obscurely 10-lobed or subtruncate, the bare nerves reaching the margin; petals bright pink. Fl. July-September.

Stony fine-earth mountain slopes in the alpine zone. — Soviet Central Asia: Pam.-Al. (NE part — Alai Valley area), T. Sh. (Centr. and S. part).

Gen. distr.: Dzu.-Kash. (S. part, areas adjoining Pamir and Centr. Tien Shan). Described from Alai Range (Archaty Pass). Type in Leningrad.

12. **A. Alexandri** Fed. in Bot. zhurn. SSSR, XXXIII, 1 (1948) 34. — Ic.: Fed. l. c., Plate III.

Loosely pulvinate, commonly low and more or less depressed shrubs, up to 40-50 cm in diameter; leaves green or glaucescent-green, flat, rather rigid, somewhat enlarged at apex, linear or narrowly oblanceolate to broadly oblanceolate or oblong-obovate, (1) 3-6 (10) cm long and 3-5 (7) mm broad, short-acerose, glabrous, the entire margin minutely ciliate-scabrous; scopes greatly exceeding the leaves, up to 15-20 cm long, simple or rarely with 2-3 branches, ranging from rather densely short-hairy to glabrate; spikes terminal, up to 4-5 cm long, densely 5-10 (15)-spiculed, distinctly 2-ranked, sometimes interrupted in lower part; spicules 12-14 mm long, (1) 2-3-flowered; all bracts about equal, more or less distinctly exceeding the calyx tube; outer bract 8-11 mm long, irregularly ovate or elliptic, gradually acuminate at apex, mucronulate, rather broadly scarious-margined, glabrous or scarcely hairy; inner bracts broadly scarious-margined or scarious throughout except for the rather narrow midrib, the short mucro sometimes dorsal; calyx 10-12 mm long, funnellform, the tube ca. 5-7 mm long, sparsely hairy between the nerves; calyx limb ca. 4-5 mm broad, pink to dark purple, obscurely 10-lobed or subtruncate, the bare nerves reaching the margin or scarcely excurrent; petals bright pink. Fl. August.

321 Mountain slopes in the subalpine (and alpine?) zone. — Soviet Central Asia: Tien Shan (W. slopes of the Fergana Range). Endemic. Described from Mt. Baubashata. Type in Leningrad.

Note. A very striking species, with very broad and quite flat leaves and hence of a rather unusual aspect for an acantholimon. Endemic for the western slopes of the Fergana Range, in the zone of walnut (*Juglans regia* L.) woods, where it was found by numerous collectors. It was already recorded in 1923 (in herb.) and described as *A. platyphyllum*

Czerniak. Such forms as *A. Fetissoyii* Rgl. and *A. Ruprechtii* Bge. and possibly also some of the small-leaved high-mountain forms such as, for instance, *A. tianschanicum* Czerniak., are undoubtedly closely related as exponents of regional (and ecological) vicariation and constitute a natural series that includes *A. Alexandri*.

13. *A. Fetissoyii* Rgl. in Trautv. Rgl. Maxim. et Winkl. Dec. pl. nov. (1882) 8 and in Tr. Bot. Sada, VIII (1883) 271 ("Fetisowi"); Fedch. O and B. Perech. rast. Turk. 5, 191.—*A. marmoreum* Korov. in Tr. Turk, nauchn. obshch. I (1923) 80.

Rather compactly pulvinate low shrubs, up to 20-40 cm in diameter; leaves glaucescent-green, flat, rather rigid, narrowly oblanceolate or sublinear to lanceolate or broadly lanceolate to subovate, up to 1.5-2 cm long and 3-4 mm broad, short-acerose, glabrous, the margin minutely ciliate-scabrous; scapes barely exceeding the leaves, up to 2.5-3 cm long, simple, densely puberulous; spikes terminal, ca. 1.5-2 cm long, rather densely (3) 5-7-spiculed, distinctly 2-ranked; spicules ca. 12 mm long, 1- or 2-flowered; outer bract ca. 6-7 mm long, usually but slightly shorter than the inner bracts and about equaling the calyx tube, irregularly and broadly ovate, gradually pointed at apex, mucronulate, rather narrowly scarious-margined; inner bracts slightly exceeding the calyx tube, very broadly scarious-margined or scarious throughout except for the rather narrow midrib, the short mucro sometimes dorsal; calyx 10-12 mm long, funnelform, the tube ca. 6-7 mm long, sparsely hairy between the nerves; calyx limb ca. 4-5 mm broad, purple or dark purple, obscurely 10-lobed or subtruncate, the bare nerves reaching the margin or rarely scarcely excurrent; petals bright pink. Fl. July-August.

Mountain slopes and calcareous rocks in the alpine zone.—Soviet Central Asia: Tien Shan (upper Talass and Susamyr rivers, Fergana Range, Kenkol Pass). Described from the western part of the Susamyr valley. Type in Leningrad.

14. *A. Ruprechtii* Bge. in Mem. Acad. Sc. Petersb. VII ser. XVIII, 2 (1872) 20 ("Ruprechtii"); Fedch. O. and B. Perech. rast. Turk. 5, 187.—
322 *A. latifolium* Rupr. in Mem. Acad. Sc. Petersb. VII ser. XIV, 4 (1869), 69, non Boiss. (1859).

Loosely pulvinate low shrubs, 5-15 cm in diameter; leaves cinerescent-green, flat, rather rigid; narrowly oblanceolate to sublinear or lanceolate, up to 1-1.5 cm long and 2-2.5 mm broad, short-acerose, glabrous, the entire margin minutely ciliate-scabrous; peduncles barely exceeding the leaves, up to 2-2.5 cm long, simple, densely covered with short hairs; spikes terminal, ca. 1.5 cm long, densely 5-7-spiculed, distinctly 2-ranked; spicules ca. 10 mm long, 1- or 2-flowered; all bracts about equal, distinctly exceeding or about equaling the calyx tube, rather densely covered with short hairs; outer bract 6-7 mm long, irregularly and broadly ovate, gradually pointed at apex, mucronulate, broadly scarious-margined; inner bracts very broadly scarious-margined or scarious throughout except for the rather narrow midrib, the short mucro sometimes dorsal; calyx 8-9 mm long, funnelform, the tube ca. 5 mm long, sparsely hairy between the nerves; calyx limb ca. 4 mm broad, purple or dark purple, obscurely

10-lobed or subtruncate, the nerves more or less distinctly excurrent, densely hairy on the lower one-half or two-thirds; petals bright pink. Fl. August.

Mountain slopes in the alpine zone. — Soviet Central Asia: Tien Shan (Dzhaman-Daban Pass in the SW part of Centr. Tien Shan). Endemic. Described from the location indicated. Type in Leningrad.

15. **A. compactum** Korov. in Tr. Turk. nauch. obsch. I (1923) 83.

Very compactly pulvinate hemispherical shrubs, 5-15 cm in diameter; leaves glaucous, flat, narrowly linear-lanceolate or linear, rigid, (0.5) 1-1.5 (2.5) cm long and ca. 1-1.5 mm broad, rather gradually pointed at apex, short-acerose, glabrous, the entire margin minutely ciliate-scabrous; scapes greatly exceeding the leaves, up to 15-20 cm long, flat, densely covered with short hairs; spikes sparsely 5-8-spiculed, 4-7 cm long, the joints about equaling the spicules; spicules ca. 15 mm long, 2- or 3-flowered; all bracts hairy; outer bract ca. 6-8 mm long, much shorter than the inner bracts and the calyx tube, irregularly ovate, gradually narrowed toward apex, mucronulate, rather narrowly scarious-margined; inner bracts about half as long again as the outer one and greatly exceeding the calyx tube, sometimes reaching the middle of the limb, very broadly scarious-margined or scarious throughout except for the narrow and rather broadly carinate-winged midrib, the short mucro usually dorsal; calyx 10-12 mm long, funnelform, the tube ca. 6-8 mm long, sparsely hairy between the nerves; calyx limb ca. 3-4 mm broad, pink, obscurely 10-lobed, the purple nerves reaching the margin, hairy in lower part; petals pink. Fl. July-August.

Stony fine-earth mountain slopes, usually in wormwood or grass-wormwood associations, at altitudes of about 1500-2000 m. — Soviet Central Asia: Pam.-Al. (N. slopes of the Alai and Turkestan ranges from Shakhimardan to the Isfara River basin). Endemic. Described from the Shakhimardan area. Type in Tashkent; isotype in Leningrad.

16. **A. Mikeschinii** Lincz. sp. n. in Addenda XVII, 733.

A rather densely pulvinate subhemispherical shrub, 10-20 cm in diameter, leaves glaucous or greenish-glaucous, flat, narrowly linear-lanceolate to linear, rigid, (1) 1.5-2.5 (3) cm long and 1-1.5 (2) mm broad, gradually narrowed toward apex, short-acerose, glabrous, the entire margin minutely ciliate-scabrous; scapes greatly exceeding the leaves, 8-15 cm long, simple, rather densely puberulous; spikes sparsely 4-8-spiculed, 6-10 cm long, the joints about as long as the spicules; spicules ca. 10-12 mm long, 2 or 3-flowered; all bracts glabrous; outer bract 7-10 mm long, markedly shorter than the inner ones, commonly about equaling the calyx tube, irregularly oblong-ovate, very gradually narrowed in lower part, cuspidate; inner bracts usually much longer than the outer bract and the calyx tube, reaching or even markedly surpassing the middle of the limb, very broadly scarious-margined or scarious throughout except for the carinate (not carinately-winged) midrib, the short mucro sometimes dorsal; calyx ca. 10 mm long, funnelform, the tube ca. 6-7 mm long, rather densely hairy between the nerves; calyx limb ca. 3 mm broad, pink, obscurely 10-lobed, the bare purple nerves reaching the margin; petals pink. Fl. June-July.

Stony mountain slopes and plateaus, at altitudes of about 1000 m. — Soviet Central Asia: Tien Shan (Karatau Range). Endemic. Described from the natural boundary of Akchektau. Type in Leningrad.

Note. A species related to *A. compactum* Korov., but clearly distinguishable by the less compact cushions, longer leaves, and the inner bracts; these being long and often exceeding the calyx, carinate (not carinately-winged) dorsally, and glabrous.

17. *A. strictum* Czerniak. sp. n. in Addenda XVII, 734. — *A. bromifolium* Czerniak. in Tr. Bot. Sada, XLIV (1931) 94, non Boiss.

- 324 Rather loosely pulvinate subhemispherical shrubs, 15-20 cm in diameter; leaves greenish-glaucous, flattened, triquetrous-subulate, strict, rigid, 2-3.5 (4) cm long and ca. 1 mm broad, short-acerose, glabrous, the margin minutely ciliate-scabrous or smooth; scapes greatly exceeding the leaves, up to 15-30 cm long, simple or rarely scarcely branched, glabrous and smooth or rarely minutely puberulous; spikes sparsely (3) 5-7-spiculed, ca. 5-12 cm long, the intervals 2-3 times the length of spicules; spicules ca. 12 mm long, 2- or 3-flowered; bracts glabrous or rarely covered with very short hairs; outer bract ca. 8-9 mm long, markedly shorter than the inner bracts and about equaling the calyx tube, irregularly ovate or oblong-ovate, gradually narrowed toward apex, mucronulate, rather narrowly scarious-margined; inner bracts greatly exceeding the calyx tube, reaching the middle of the limb, broadly scarious-margined or scarious throughout except for the narrow midrib, minutely and mostly dorsally mucronulate; calyx ca. 11-12 mm long, funnelform, the tube 7-8 mm long, rather densely covered between the nerves with long hairs; calyx limb ca. 3-4 mm broad, pink, rather distinctly 10-lobed or subtruncate, the purple nerves slightly excurrent, bare or in lower part sparsely hairy; petals bright pink. Fl. June.

Stony fine-earth mountain slopes, commonly in wormwood associations, at altitudes of 1000-1500 m. — Soviet Central Asia: Mtn. Turkm. (Central Kopet Dag, from Firyuza to Arvaz). **Gen. distr.:** ? Iran. Described from the Firyuza area. Type in Leningrad.

Note. A species affiliated to the Iranian *A. bromifolium* Boiss. and *A. scirpinum* Bge.; differing from *A. bromifolium* in the much narrower subulate leaves and the few-spiculed spikes; from *A. scirpinum* in the much longer leaves, the longer outer bracts, and the pink (not white) calyx limb.

18. *A. Korovinii* Czerniak. in Tr. Bot. Sada, XLIV (1931) 94 ("Korovini").

- Very compactly pulvinate shrubs, fairly tall to subhemispherical, 5-15 cm in diameter; leaves greenish-glaucous, applanate-triquetrous, narrowly linear-lanceolate or linear, rigid, 0.5-1 (2) cm long and ca. 1 mm broad, gradually narrowed toward apex, acerose, glabrous, the margin minutely ciliate-scabrous; scapes barely exceeding the leaves, ca. 1-2 cm long, simple, densely and minutely puberulous; spikes ca. 1 cm long, rather sparsely 2-3 (4)-spiculed; spicules ca. 7-8 mm long, 2-flowered; outer bract ca. 5 mm long, slightly shorter than the inner bracts and about 325 equaling the calyx tube, broadly ovate, mucronate, broadly scarious-margined, glabrous; inner bracts greatly exceeding the calyx tube, reaching or surpassing the middle of the limb, very broadly scarious-margined or scarious throughout except for the narrow midrib, mostly dorsally

mucronate, sparsely covered with short hairs; calyx ca. 6-7 mm long; funnelform, the tube ca. 4 mm long, sparsely covered between the nerves with rather long hairs; calyx limb ca. 3 mm broad, white, obscurely 5-lobed, the purple nerves reaching the margin and covered in lower part with scattered hairs; petals pink. Fl. June.

Stony mountain slopes and exposed limestone, at altitudes of 1500-1750 m. — Soviet Central Asia: Mtn. Turkm. (Greater Balkhan Range). Endemic. Described from the Greater Balkhan Range. Type in Tashkent; isotype and paratypes in Leningrad.

Note. This species can hardly be associated with *A. Borodinii* Krassn. of the high mountains of Tien Shan, as suggested by Chernyakovskaya (l. c.); relationship with the species of the Iranian *A. bromifolium* Boiss. cycle is more likely.

19. ***A. pskemense*** Lincz. sp. n. in Addenda XVII, 734.

Loosely pulvinate shrubs, 20-40 (?) in diameter, with procumbent-ascending branches (up to 10 cm long); summer leaves greenish-glaucous, flat, linear-lanceolate, rigid, 2-3 cm long and ca. 2 mm broad, gradually narrowed toward apex, minutely mucronulate, the underside rather sparsely covered at base with very short hairs, glabrous elsewhere, the margin minutely ciliate-scabrous; spring leaves somewhat shorter, otherwise alike; scapes greatly exceeding the leaves, up to 15-20 cm long, simple or with 1 or 2 fairly long branches from upper half, rather densely and minutely puberulous; spikes loosely 10-12-spiculed, the joints half as long as to equaling the spicules; spicules ca. 13-14 mm long, the lowest 2-flowered, the others 1-flowered; outer bract glabrate, ca. 5 mm long, about two-thirds the length of the inner bracts, oblong-ovate, gradually narrowed toward apex, minutely mucronulate, rather narrowly scarious-margined; inner bracts densely covered with very short hairs, slightly shorter than to about equaling the calyx tube, very broadly scarious-margined, gradually narrowed toward apex, minutely mucronulate or muticuous; calyx ca. 12 mm long, funnelform, the tube ca. 6-7 mm long, sparsely covered between the nerves with very short hairs; calyx limb ca. 5-6 mm broad, pink, distinctly 10-lobed, the nerves reaching the margin and hairy in lower part; petals pink. Fl. July (?).

326 Stony mountain slopes in the tree and scrub zone. — Soviet Central Asia: Tien Shan (W. part, Pskem River basin). Endemic. Described from the vicinity of the village of Pskem. Type in Leningrad.

Note. Most closely related to *A. Ekatherinae* (B. Fedtsch.) Czerniak.; distinguished by the presence of 2-flowered spicules, tall and often long-branched scapes, longer narrow leaves, and hairy bracts. Both species occur in the same district (Chirchik River basin) and apparently display altitudinal vicariation, the more elevated *A. Ekatherinae* being characterized by considerable reduction of scapes and (always?) single-flowered spicules. It should be noted that similar relationships exist among the Tien Shan species, between *A. Alexandri* Fed. on the one hand, and *A. Fetissoyii* Rgl. and *A. Ruprechtii* Bge. on the other, where *A. Alexandri* of lower altitudes has taller and sometimes branched scapes, while the high-mountain *A. Fetissoyii* and *A. Ruprechtii* have short scapes and almost exclusively single-flowered spicules.

20. *A. Ekatherinae* (B. Fedtsch.) Czerniak. comb. n. — *Chomutowia Ekatherinae* B. Fedtsch. in Bot. Mat. Gerb. Bot. Sada, III (1922) 3 (gen. et sp. nov.). — *A. tschimganicum* Korov. in Tr. Turk. nauchn. obshch. I (1923) 79, nomen.

Very loosely pulvinate shrubs, 20-30 cm in diameter, with procumbent-ascending branches 10-20 cm long; summer leaves greenish-glaucous, flat, linear-lanceolate to lanceolate or narrowly obovate (borne on the middle part of the always rather densely puberulous shoots of the current year) subdistant and rather weakly sheathing, rigid, (0.5) 1-1.5 (2) cm long and ca. 2-4 mm broad, rather gradually narrowed toward apex, not acerose or but slightly so, fairly densely hairy or glabrous, the margin ciliate-scabrous; spring leaves, at the base of current year's shoots, somewhat shorter, with more developed sheaths, otherwise alike; scapes considerably exceeding the leaves, ca. 4-8 cm long, simple, rarely scarcely branched, rather densely puberulous to glabrate; spikes rather loosely 4-8-spiculed, the joints sometimes about half the length of the spicules; spicules ca. 12-13 mm long, all (?) single-flowered; bracts glabrous; outer part ca. 4-5 mm long, about one-half to two-thirds as long as the inner ones, ovate, rather gradually narrowed toward apex, minutely mucronulate or muticous, rather narrowly scarious-margined; inner bracts shorter than the calyx tube, very broadly scarious-margined, rather gradually narrowed toward
327 apex, minutely mucronulate or muticous; calyx ca. 11-12 mm long, funnelform, the tube ca. 7-8 mm long, sparsely covered between the nerves with short hairs; calyx limb ca. 4-5 mm broad, pink or purple, distinctly 10-lobed, the bare nerves reaching the margin or scarcely excurrent; petals pink. Fl. July-September.

Stony mountain slopes in the subalpine and alpine zones. — Soviet Central Asia: Tien Shan (W. part, Chatkal River basin). Endemic. Described from Mt. Bol'shoi Chimgan. Type in Leningrad.

Note. A species of striking aspect owing to the relatively broad and practically unarmed leaves. The (always?) single-flowered spicules would formally place it in the section *Staticopsis*; however, in view of the close relationship to *A. pskemense* which indubitably belongs to the section *Glumaria*, I am disinclined to relate these species to different sections. There is no justification for separating *A. Ekatherinae* in a distinct genus, *Chomutowia* B. Fedtsch., since the only characteristic claimed for this genus — "axillary" and not "terminal" scapes — applies in fact to all species of *Acantholimon*: their scapes are always axillary. Similarly, any particularly close relationship to the Indo-Australian tropical genus *Aegialitis* R. Br. is more than dubious. Of much interest, however, and probably correct in principle, is the view expounded by B. A. Fedchenko (l. c.) in connection with the description of this species, that the more mesophilous forms come first in the evolutionary series of *Acantholimon* species. This is opposed to Bunge's theory that highly specialized xerophytic *A. diapensioides* Boiss. represents the primary type of the genus.

Section 4. **STATICOPSIS** Boiss. em. Bge. in Mem. Acad. Sc. Petersb. VII ser. XVIII, 2 (1872) 24; Boiss. Fl. or. IV, 831. — Sect. *Staticopsis* Boiss. Diagn. ser. 1, VII (1846) 71 et in DC. Prodr. XII (1848) 624, pro max. parte, excl. sp. nonn. — Spicules always single-flowered, 3-bracted,

in short and more or less compactly capitate or rather loosely oblong spikes borne on simple or branched scapes; outer bracts with a moderately broad scarious margin; calyx funnelform, straight at base; the nerves of the limb narrow, bare within; leaves commonly scabrous-margined, spring and summer leaves rather similar; summer leaves commonly applanate-triquetrous, narrow, linear-subulate or acicular; spring leaves only slightly shorter and broader.

21. **A. avenaceum** Bge. in Mem. Acad. Sc. Petersb. VII ser. XVIII, 2 (1872) 25; Boiss. Fl. or. IV, 831; Fedch. O and B. Perech. rast. Turk. 5, 188, p.p. quoad specim. kopetdagh. — Exs.: Sintenis, It. transcasp. - pers. 1900-1901, Nos. 678 (f. simplicior Bornm.), 1028.

328 Rather loosely pulvinate hemispherical shrubs, 15-25 cm in diameter; summer leaves pale green or glaucescent-green, applanate-triquetrous, linear-subulate, rigid, (1.5) 2-3 (4) cm long and ca. 1 mm broad (up to 2 mm at base), acerose, glabrous, the margin minutely ciliate-scabrous throughout or merely at base; spring leaves (at the base of current year's shoots) somewhat shorter and broader, otherwise alike; scapes greatly exceeding the leaves, 10-25 (50) cm long, short-branched in upper part or rarely simple, glabrous; spikes loose, the intervals on the main axis about equaling to twice the length of the spicules, shorter on the lateral branches; spicules ca. 10 mm long, all single-flowered; bracts glabrous; outer bract 4-5 mm long, commonly about half as long as the inner ones, suboblong-ovate, gradually narrowed toward apex, mucronate or muticuous, rather narrowly scarious-margined; inner bracts about equaling the calyx tube, broadly scarious-margined, subobtuse to almost round-tipped, mucronate or muticuous; calyx ca. 10-11 mm long, funnelform, the tube ca. 6-7 mm long, rather sparsely hairy between the nerves; calyx limb ca. 4-5 mm broad, purple or pale purple to nearly white except for narrow purple stripes along the nerves, distinctly 10-lobed, the bare nerves reaching the margin or scarcely excurrent; petals bright pink. Fl. July-August.

Stony mountain slopes, at altitudes of 1500-1800 m. — Soviet Central Asia: Mtn. Turkmen. (Centr. and W. Kopet Dagh). **Gen. distr.:** Iran. (N. Khurasan). Described from the Meshkhed area. Type in Leningrad.

22. **A. khorassanicum** Czerniak. in Tr. Bot. Sada, XLIV (1931) 96.

331 Rather compactly pulvinate subhemispherical shrubs, 15-25 cm in diameter; summer leaves glaucous, applanate-triquetrous, linear-subulate, rigid, (1.5) 2-3 (3.5) cm long and ca. 1.5-2 mm broad (up to 3 mm at base), acerose, glabrous, the entire margin usually minutely ciliate-scabrous; spring leaves at the base of current year's shoots somewhat shorter and broader, otherwise alike; scapes greatly exceeding the leaves, 10-20 cm long, short-branched in upper part, rarely simple, glabrous or (in var. kopetdaghense Czerniak.) puberulous; spikes ca. 2 cm long, loosely
3-7-spiculed, long-jointed, terminal on the main axis and on branches, in the latter case the spikes subsessile; spicules ca. 12 mm long, all single-flowered; bracts glabrous; outer bract ca. 5-7 mm long, one-half to two-thirds the length of the inner bracts, oblong-ovate, gradually narrowed toward apex, minutely mucronulate or muticuous, rather narrowly scarious-margined; inner bracts markedly exceeding the calyx tube, broadly scarious-margined, rather broadly round-tipped, obtuse and muticuous;

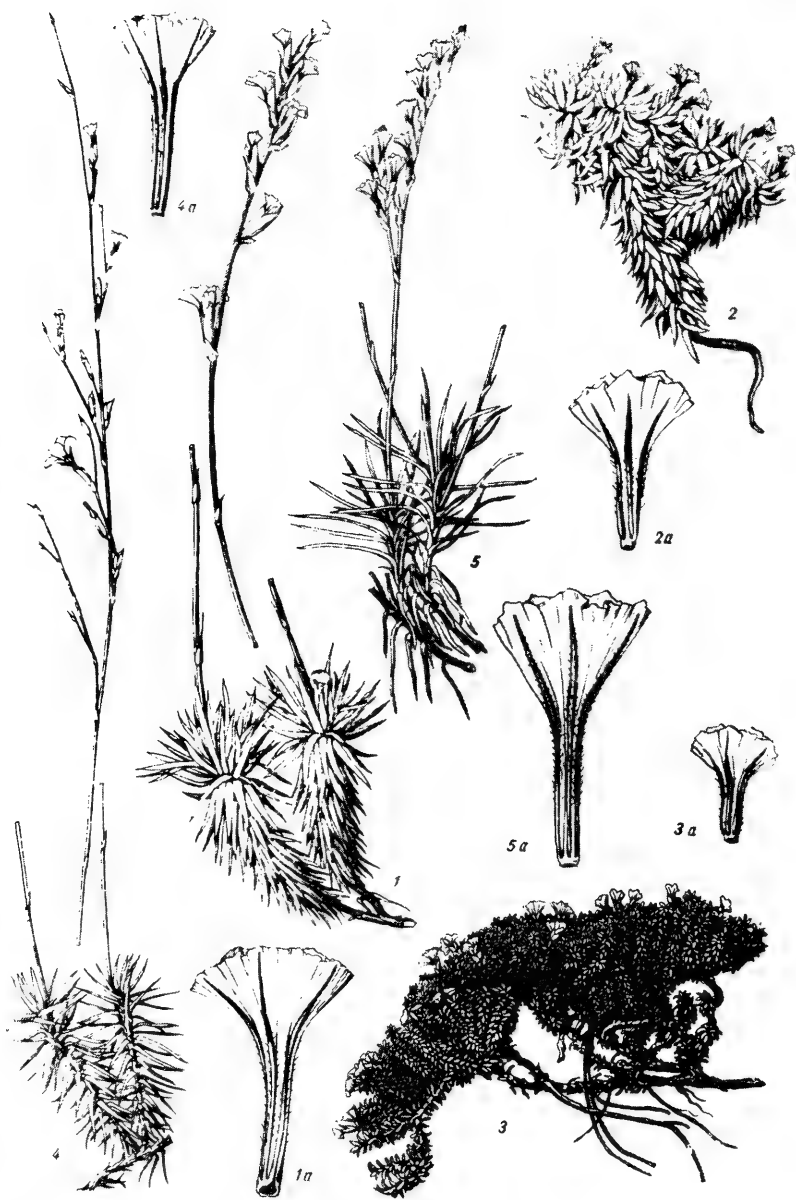


Plate XVII

1. *Acantholimon tataricum* Boiss., 1a) calyx. 2. *A. Zaprjagaevii* Lincz., 2a) calyx.
 3. *A. diapiensoides* Boiss., 3a) calyx. 4. *A. aulieatense* Czerniak., 4a) calyx. 5. *A. Albertii*
 Rgl., 5a) calyx.

calyx ca. 10-11 mm long, funnelform, the tube ca. 6 mm long, sparsely covered between the nerves with rather long hairs; calyx limb ca. 5 mm broad, purple or dark purple, rather distinctly 10-lobed, the bare nerves reaching the margin or scarcely excurrent; petals pink. Fl. July-August.

Stony mountain slopes, in juniper woods, at altitudes of about 1800-2400 m. — Soviet Central Asia: Mtn. Turkm. (Centr. Kopet Dagħ). **Gen. distr.:** Iran. (N. Khurasan). Described from Khurasan (Khazar-Mechet upland) and Central Kopet Dagħ. Type in Leningrad.

23. **A. procumbens** Czerniak. in Tr. Bot. Sada, XLIV (1931) 97.

Loosely pulvinate low shrubs, 30-50 cm in diameter, with long procumbent branches; summer leaves pale green, applanate-triquetrous, linear-subulate, rigid, 1.5-3 cm long and ca. 1-1.5 mm broad (up to 2 mm at base), acerose, glabrous, the margin minutely ciliate-scabrous at base and smooth elsewhere; spring leaves somewhat shorter and scarcely broader, with margin minutely ciliate-scabrous throughout, otherwise resembling the summer leaves; scapes barely exceeding the leaves, ca. 2-3 cm long, simple, glabrous; spikes terminal, ca. 2-2.5 cm long, rather compactly 5-9-spiculed, more or less distinctly 2-ranked; spicules 12-13 mm long, all single-flowered; bracts glabrous; outer bract ca. 5-7 mm long, about two-thirds the length of the inner ones, oblong-ovate, gradually narrowed toward apex, mucronate, rather narrowly scarious-margined; inner bracts greatly exceeding the calyx tube, reaching or surpassing the middle of the limb, broadly or very broadly scarious-margined, rounded at apex, minutely mucronulate; calyx ca. 12 mm long, funnelform, the tube ca. 7 mm long, sparsely covered between the nerves with rather long hairs; calyx limb ca. 5 mm broad, purple, rather distinctly 10-lobed, the bare nerves reaching the margin or scarcely excurrent; petals bright pink. Fl. July.

Stony mountain slopes, at altitudes of ca. 2300 m. — Soviet Central Asia: Mtn. Turkm. (Central Kopet Dagħ). **Gen. distr.:** Iran. (?). Described from Mt. Chapān-Dagħ. Type in Leningrad.

24. **A. aulieatense** Czerniak. in Bot. Mat. Gerb. Bot. Sada, IV (1923, May) 65. — **A. gramineum** Korov. in Tr. Turkm. nauchn. obshch. I (1923) 82.

Rather compactly pulvinate subhemispherical shrubs, 10-20 cm in diameter; summer leaves glaucescent-green, applanate-triquetrous, linear-subulate, rigid, 1-2 (3) cm long and ca. 1-1.5 mm broad, acerose, glabrous, the margin minutely ciliate-scabrous throughout or merely at base; spring leaves barely shorter and broader, otherwise alike; scapes greatly exceeding the leaves, 15-25 (35) cm long, with slender and rather long branches in upper part or sometimes nearly from base, glabrous; spikes remotely spiculed (the intervals 2-3 times the length of spicules), borne on the main axis or on the nearly always long and sometimes slightly nodding branches; spicules ca. 10-11 mm long, all single-flowered; bracts glabrous; outer bract ca. 3-4 mm long, about half as long as the inner bracts, suboblong-ovate, gradually narrowed toward apex, mucronate, narrowly scarious-margined; inner bracts about equaling or slightly shorter than the calyx tube, rather broadly scarious-margined, gradually narrowed toward apex, mucronulate; calyx ca. 9-10 mm long, funnelform, the tube

ca. 6-7 mm long, very sparsely hairy between the nerves; calyx limb ca. 3 mm broad, pink or purple, rather distinctly 10-lobed, the bare nerves reaching the margin or scarcely excurrent; petals pale pink. Fl. July-October (Plate XVII, Figures 4, 4a).

Stony mountain slopes, at altitudes of about 800-1500 m. — Soviet Central Asia: Tien Shan (Mt. Dzhambul area: western extremity of Kirghiz Ala Tau Range, Ichkeletau Range and SE part of Karatau Range, west as far as the natural boundary of Chim-Bulak and Ber-Kara Gorge). Endemic. Described from the area indicated. Type in Leningrad.

25. **A. purpureum** Korov. in Tr. Turk. nauchn. obshch. I (1923) 81.

333 Rather loosely pulvinate hemispherical shrubs, 20-30 cm in diameter; summer leaves glaucescent-green, applanate-triquetrous, linear-subulate, rigid, (1.5) 2-2.5 cm long and ca. 1 mm broad, acerose, glabrous, the margin minutely ciliate-scabrous; spring leaves but slightly shorter and scarcely broader, otherwise alike; scapes markedly exceeding the leaves, 5-10 cm long, short-branched or simple, glabrous; spikes loose (the joints about equaling or shorter than the spicules), borne on the main axis and occasionally on its branches; spicules ca. 13-14 mm long, all single-flowered; bracts glabrous; outer bract ca. 4-5 mm long, about half as long as the inner ones, oblong-ovate, gradually narrowed toward apex, mucronate, narrowly scarious-margined; inner bracts about equaling the calyx tube, rather broadly scarious-margined, gradually narrowed toward apex, mucronate; calyx ca. 12-13 mm long, funnelform, the tube ca. 8 mm long, rather sparsely covered between the nerves with short hairs; calyx limb ca. 4-5 mm broad, dark purple, rather distinctly 10-lobed, the bare nerves reaching or nearly reaching the margin; petals bright pink; Fl. July.

Stony mountain slopes and rocks in the alpine and subalpine zones. — Soviet Central Asia: Tien Shan (W. part of the Kirghiz Ala Tau Range). Endemic. Described from the natural boundary of Kan-Dzhailau. Type in Tashkent; isotype in Leningrad.

26. **A. minshelkense** Pavl. in Vestn. Akad. Nauk Kazhakhsk. SSR, I (1949) 35.

Rather loosely pulvinate and prostrate shrubs, ca. 10 cm in diameter, summer leaves pale green, applanate-triquetrous, linear subulate, acerose, glabrous, rugose, (0.5) 1-1.5 cm long, and ca. 0.5-1 mm broad, glabrous, the margin minutely ciliate-scabrous or smooth; spring leaves but slightly shorter and broader, otherwise alike; scapes greatly exceeding the leaves, 6-12 cm long, with very short branches in upper part, rarely simple, glabrous; spikes loose (the joints about half as long again to twice as long as the spicules), borne on the main axis or subapproximately on the lateral branches; spicules ca. 8-9 mm long, all single-flowered; bracts glabrous; outer bract ca. 3-4 mm long, about two-thirds as long as the inner ones, suboblong-ovate, rather gradually narrowed toward apex, cuspidate, narrowly scarious-margined; inner bracts about two-thirds the length of the calyx tube, broadly scarious-margined, obtusely round-tipped or subtruncate, apiculate-mucronate; calyx ca. 8-9 mm long, funnelform, the tube ca. 6 mm long, rather sparsely hairy between the nerves; calyx tube ca. 2.5-3 mm broad, pink or purple, rather distinctly 10-lobed, the nerves reaching the margin or scarcely excurrent; petals pink. Fl. July-August.

Mountain rocks, at altitudes of about 2000 m.—Soviet Central Asia: Tien Shan (Karatau Range). Endemic. Described from the Minzhelke upland area*. Type in Alma Ata.

27. **A. Margaritae** Korov. sp. n. in Addenda XVII, 735.

334 Very loosely pulvinate subhemispherical shrubs, 20-30 cm in diameter, with long procumbent-ascending branches; summer leaves green, applanate-triangular or nearly flat, linear-subulate, rigid, (1.5) 2-3.5 cm long and ca. 1 mm broad, acerose, glabrous, the margin minutely ciliate-scabrous or smooth; spring leaves markedly shorter and scarcely broader, otherwise alike; scapes greatly exceeding the leaves, ca. 12-15 cm long, with rather long branches in upper part, glabrous; spikes loose (the joints about as long as the spicules), floriferous on the main axis and on its branches; spicules ca. 13-14 mm long, all single-flowered; bracts glabrous; outer bracts ca. 2-3 mm long, about one-third to one-half as long as the inner ones, ovate, obtusely acuminate, muticous or minutely mucronulate, narrowly scarious-margined; inner bracts about two-thirds as long as the calyx tube, broadly scarious-margined, broadly round-tipped or subtruncate, minutely mucronulate or muticous; calyx ca. 12-13 mm long, funnelform; calyx tube ca. 7-8 mm long, very sparsely hairy between the nerves to glabrate; calyx limb ca. 5 mm broad, purple, rather distinctly 10-lobed, the bare nerves scarcely excurrent; petals pink. Fl. July-August.

Rocks, in juniper woods.—Soviet Central Asia: Tien Shan (Kuraminskii Range — northern, Angren** slopes). Endemic. Described from Kosh-Sai. Type in Tashkent; isotype in Leningrad.

Note. Apparently a species of *A. aulieatense* Czerniak. affiliation. Distinguished by the large and loose cushions, much longer leaves, shorter inner bracts, and larger calyx.

28. **A. nuratavicum** Zakirov sp. n. in Addenda XVII, 736.

335 Compactly pulvinate subhemispherical shrubs, 10-20 cm in diameter; summer leaves greenish-glaucous, applanate-triangular to nearly flat, narrowly linear-lanceolate or nearly subulate, rigid, 0.5-1 (1.5) cm long and ca. 0.5-1 mm broad, acerose, densely covered with very short hairs, the entire margin minutely ciliate-scabrous; spring leaves slightly shorter and broader, otherwise alike; scapes greatly exceeding the leaves, 10-15 cm long, simple, minutely puberulous at base and glabrous elsewhere; spikes loose (the intervals equaling to twice as long as the spicules); spicules borne on the upper part of the scape, ca. 11-12 mm long, all single-flowered; bracts glabrous; outer bract ca. 3-4 mm long, about half as long as the inner bracts, suboblong-ovate, gradually narrowed toward apex, mucronate, narrowly scarious-margined; inner bracts shorter than the calyx tube, broadly scarious-margined, obtusely round-tipped or subtruncate, minutely mucronulate or muticous; calyx ca. 10 mm long, funnelform, the tube ca. 6 mm long, rather densely hairy between the nerves; calyx limb ca. 4 mm broad, pink or purple, distinctly 10-lobed, the bare nerves scarcely reaching the margin; petals pink. Fl. July-August.

Stony mountain slopes.—Soviet Central Asia: Pam.-Al. (Nuratau Range). Endemic. Described from Sintabskoe Plateau. Type in Tashkent.

* [Mt. Mynzhilgi, Kazakh SSR.]

** [Angren Plateau.]

Note. Affiliated to *A. minshelkense*, from which it differs in the somewhat shorter hairy leaves, simple scapes, and the slightly larger and broader calyx limb.

29. **A. Gontscharovii** Czerniak. in Tr. Bot. Sada, XLIV (1931) 95.

Compactly pulvinate, low shrubs, 10-20 cm in diameter; summer leaves greenish-glaucous, applanate-triquetrous or nearly flat, narrowly linear to nearly subulate, rigid, (0.5) 1-1.5 cm long and ca. 1 mm broad, acerose, densely covered with short hairs, the entire margin densely and minutely ciliate-scabrous; spring leaves markedly shorter and broader (up to 2 mm), glabrous, otherwise alike; scapes greatly exceeding the leaves, 8-15 cm long, short-branched in upper part, densely covered with short hairs; spikes loose, the joints usually shorter than the spicules; spicules borne on the main axis and somewhat more approximate on the lateral branches; ca. 12 mm long, all single-flowered; bracts more or less covered with short hairs; outer bract ca. 3-4 mm long, about half as long as the inner ones, suboblong-ovate, gradually narrowed toward apex, minutely mucronulate, rather narrowly scarious-margined; inner bracts about equaling the calyx tube, broadly scarious-margined, obtusely acuminate or round-tipped, minutely mucronulate or muticous; calyx ca. 11-12 mm long, funnellform, the tube ca. 7-8 mm long, rather densely hairy between the nerves; calyx limb ca. 4-5 mm broad, initially lemon-yellow (?), becoming pink, distinctly 10-lobed, the nerves rather densely covered in lower part with short hairs and reaching the margin; petals pink. Fl. August-September.

Stony mountain slopes, at altitudes of about 1600 m. — Soviet Central Asia: Pam.-Al. (southern slopes of the W. part of the Gissar Range). Endemic. Described from Tupalang River basin. Type in Leningrad.

30. **A. hissaricum** Lincz. sp. n. in Addenda XVII, 736.

336 Rather compactly pulvinate subhemispherical shrubs, 10-20 cm in diameter; summer leaves pale green or glaucescent-green, applanate-triquetrous to nearly flat, narrowly linear-lanceolate to nearly subulate, rigid, (0.5) 1-1.5 cm long and ca. 1 mm broad, acerose, glabrous, the margin minutely ciliate-scabrous throughout or merely at base; spring leaves markedly shorter and broader (up to 2 mm), otherwise alike; scapes greatly exceeding the leaves, 5-10 cm long, short-branched in upper part or simple, glabrous; spikes loose, the joints equaling or slightly shorter than the spicules; spicules borne on the main axis and somewhat more approximate on the lateral branches, ca. 13-14 mm long, all single-flowered; bracts glabrous; outer bract ca. 4-5 mm long, about half as long as the inner ones, suboblong-ovate, gradually narrowed toward apex, mucronate, rather narrowly scarious-margined; inner bracts about equaling the calyx tube, rather broadly scarious-margined, obtusely acuminate or round-tipped, mucronate; calyx ca. 12-13 mm long, funnellform, the tube ca. 7 mm long, sparsely covered between the nerves with short hairs; calyx limb ca. 5 mm broad, pink or purple, rather distinctly 10-lobed, the bare nerves reaching the margin; petals pink. Fl. July-August.

Stony mountain slopes, at altitudes of about 2500 m. — Soviet Central Asia: Pam.-Al. (W. part of the Gissar Range). Endemic. Described from the Tash-Khurgan area. Type in Leningrad.

Note. A species affiliated to *A. Gontscharovii* Czerniak., clearly distinguishable by the glabrous leaves, scapes, and bracts.

31. **A. saravschanicum** Rgl. in Izv. Obshch. lyubit. estestvozn., antrop. i etnogr. XXXIV, 2 (1882) 73 ("sarawschanicum"); Fedch. O. and B. Perech. rast. Turk. 5, 187.

Very loosely pulvinate subhemispherical shrubs, 15-50 cm in diameter, with rather long and often procumbent branches; summer leaves green or dark green, flat, narrowly linear-lanceolate to linear, rigid, (1) 1.5-2.5 (4) cm long and ca. 1-1.5 (2) mm broad, acerose, glabrous (rarely, in var. *villosum* Lincz., densely covered with fairly long hairs), the entire margin densely and minutely ciliate-scabrous; spring leaves markedly shorter and broader (up to 3 mm), otherwise alike; scapes greatly exceeding the leaves, 5-15 (25) cm long, mostly short-branched in upper part, rarely simple, glabrous or (in var. *villosum*) densely covered with fairly long hairs; spikes 2-3 cm long, loosely 3-5 (8)-spiculed, narrow, obscurely 2-ranked; spicules 12-15 mm long, all single-flowered; bracts glabrous; 337 outer bract ca. 6-7 mm long, about two-thirds as long as the inner bracts, oblong-ovate, long-acuminate, cuspidate, rather narrowly scarious-margined; inner bracts slightly shorter than or equaling the calyx tube, very broadly scarious-margined (nearly scarious throughout); gradually narrowed toward apex, minutely mucronulate; calyx ca. 12-15 mm long, funnelform, the tube ca. 8-10 mm long, sparsely covered between the nerves with very short hairs; calyx limb ca. 4-5 mm broad, pink or purple, rather distinctly 10-lobed, the bare nerves reaching the margin; petals pink. Fl. July-September.

Stony mountain slopes, at altitudes of about 1500-2500 m. — Soviet Central Asia: Pam.-Al. (NW part: western extremity of the Zeravshan Range, in the area of the Takhta-Karacha Pass and the village of Urgut; Gissar Range — in the area of the upper Kashka-Darya River). Endemic. Described from Sangy-Dzhuman Pass (erroneously reported in description "on the Dzhezman Pass"). Type in Moscow; isotype in Leningrad.

32. **A. virens** Czerniak, sp. n. in Addenda XVII, 737.

Very loosely pulvinate low shrubs, 25-50 cm in diameter; usually with long procumbent branches; summer leaves rather bright green, flat, linear-lanceolate to linear, rigid, (0.5) 1-1.5 (2) cm long and (1) 1.5-2 mm broad, acerose, rather densely covered with short hairs (rarely glabrous, in var. *glabrum* Lincz.), the margin very minutely ciliate-scabrous or smooth; spring leaves slightly shorter and scarcely broader, otherwise alike; scapes exceeding or not exceeding the leaves, 1.5 cm (and then spikes sessile in the leaf axils) to 5 cm long, simple, rather densely puberulous or (in var. *glabrum*) glabrous; spikes 1.5-2 cm long, rather densely 3-5 (7)-spiculed, broad, rather distinctly 2-ranked; spicules ca. 12-13 mm long, all single-flowered; bracts rather densely puberulous or (in var. *glabrum*) quite glabrous; outer bract ca. 4-6 mm long, about one-half to two-thirds as long as the inner ones, oblong-ovate, gradually pointed toward apex, cuspidate, very broadly scarious-margined (nearly scarious throughout), round-tipped or obtusely acuminate, minutely mucronulate or muticous; calyx ca. 11-13 mm long, funnelform, the tube ca. 7-8 mm long, sparsely hairy between the nerves; calyx limb ca.

- 4-5 mm broad, pink or purple (sometimes white?), rather distinctly 10-lobed, the nerves bare or in lower part hairy, reaching the margin or very nearly so, rarely excurrent; petals pink. Fl. July-August.
- 338 Stony mountain slopes and rocks, at altitudes of about 2500-3000 m. — Soviet Central Asia: Pam.-Al. (S. slopes of the Gissar Range, Vakhshkii Range, Zagara Range, Yagnov R. basin — not a perfectly typical form). Endemic. Described from Vakhshii Range (Ruyurt Pass). Type in Leningrad.

Note. A species apparently affiliated to *A. saravschanicum* Rgl., from which it differs in the still looser and prostrate cushions, on the average slightly shorter broad leaves, and the simple and very short scapes.

33. *A. Majevisanum* Rgl. in Tr. Bot. Sada, VI, 2 (1880) 391 ("Maevskianum" *); Fedch. O. and B. Perech. rast. Turk. 5 (1913) 189 ("Majewianum"). — A. Bobrovii Czerniak. in Tr. Bot. Sada, XLIV (1931) 102; Nevskii in Tr. Bot. inst. AN SSSR, ser. I, 4 (1937) 314. — Ic.: Chernyak., l. c., Fig. 2 (phot.).

Rather loosely pulvinate hemispherical shrubs, 20-40 cm in diameter; summer leaves pale green or cinerescens-green, applanate-triangular, linear-subulate, rigid, (1.5) 2.5-3.5 (5) cm long and ca. 1 mm broad, acerose, rather densely covered with short hairs; spring leaves markedly shorter and broader, up to 1.5 cm long and 1.5-2 mm broad, flat, glabrous, the entire margin densely and minutely ciliate-scarious; scapes greatly exceeding the leaves, 15-25 cm long, with rather short-branches in upper part or very rarely simple, densely puberulous; spikes loose, the joints sometimes up to twice the length of the spicules; spicules borne on the main axis and often subapproximately on the branches, ca. 10-12 mm long, all single-flowered; bracts densely subvelutinous-pubescent; outer bract 3-4 (5) mm long, about one-third to one-half as long as the inner bracts, ovate, rather gradually pointed toward apex, cuspidate, narrowly scarious-margined; inner bracts slightly shorter, equaling or barely exceeding the calyx tube, broadly scarious-margined, acuminate, minutely mucronulate or muticous; calyx ca. 9-12 mm long, funnelform, the tube ca. 7-8 mm long, rather densely hairy between the nerves and toward apex also on the nerves; calyx limb ca. (2) 3-4 mm broad, pink, distinctly 10-lobed, rather densely hairy in lower part between the nerves, the nerves densely hairy in lower part, reaching the margin or scarcely excurrent; petals pink. Fl. June-August.

- 339 Stony mountain slopes, at altitudes of 1300-2400 m. — Soviet Central Asia: Pam.-Al. (SW part — Kugitang Range and Ak-Bash Mts.). Endemic. Described from the Ak-Bash mountain area. Type in Leningrad.

34. *A. gaudanense* Czerniak. in Tr. Bot. Sada, XLIV (1931) 99.

Rather loosely pulvinate, subhemispherical shrubs, 15-30 cm in diameter; summer leaves pale green (cinerescens), bluntly applanate-triangular, linear-subulate, rigid, (1.5) 2-3.5 (7) cm long and ca. 1-1.5 mm broad, acerose, very densely velutinous-puberulous; spring leaves markedly shorter and slightly broader, up to 1.5 cm long and 2 mm broad,

* Named after the collector and investigator of Soviet Central Asia, N. A. Maev (1835-1896), and not "Maevskii"; the orthographic error, admitted by Regel, is subject to correction according to paragraph 70 of "The Rules of Botanical Nomenclature".

flatter, also densely hairy; scapes greatly exceeding the leaves, 15-30 cm long, commonly fairly long-branched nearly from base, very rarely simple, densely pubescent; spikes loose, the joints usually 2-3 times the length of spicules; spicules borne on the main axis and often subapproximately on the lateral branches, ca. 10 mm long, all single-flowered; bracts densely subvelutinous-pubescent; outer bract ca. 5 mm long, about one-half to two-thirds as long as the inner bracts, oblong-ovate, long-acuminate, cuspidate, narrowly scarious-margined; inner bracts markedly exceeding the calyx tube, often reaching the middle of the limb, broadly scarious-margined, rather gradually [?] or obtusely acuminate, minutely mucronulate or muticous; calyx ca. 9-10 mm long, funnelform, the tube ca. 6-7 mm long, rather sparsely hairy between the nerves; calyx limb ca. 3-4 mm broad, pink, distinctly 10-lobed, sparsely hairy in lower part between the nerves, the nerves reaching the margin or scarcely excurrent and rather densely hairy in lower part; petals bright pink. Fl. July-August.

Stony mountain slopes, at altitudes of 1000-1200 m. — Soviet Central Asia: Mtn. Turkm. (Kopet Dag Range south of Ashkhabad and south of Bakharden — not a perfectly typical form). **Gen. distr.:** Iran. (?). Described from the Gaudan area. Type in Leningrad.

35. **A. erythraeum** Bge. in Regel, Tr. Bot. Sada, III (1875) 99 and in Izv. Obshch. lyubit. estestvozn., antrop. i etnogr. XXXIV, 2 (1882) 72; Fedch. O and B. Perech. rast. Turk. 5, 191; Chernyak. in Tr. Bot. Sada, XLIV, 99.

340 Rather loosely pulvinate subhemispherical shrubs, 25-50 (100) cm in diameter, with rather long sometimes procumbent branches; summer leaves pale green, applanate-triquetrous, linear-subulate, rigid, 2-3.5 (4) cm long and ca. 1-1.5 mm broad, acerose, glabrous, or more or less densely hairy, the margin commonly smooth; spring leaves slightly shorter and broader (up to 2 mm), glabrous, the margin minutely ciliate-scabrous; scapes scarcely or slightly exceeding the leaves, 4-6 (10) cm long, simple, glabrous or more or less densely pubescent; spikes terminal, small, 2-3 cm long, fairly compactly or loosely 5-10 spiculed, more or less distinctly 2-ranked or unilateral; spicules ca. 12-15 mm long, all single-flowered; bracts glabrous or more or less densely hairy; outer bract ca. 5-7 mm long, about one-half to two-thirds as long as the inner bracts, oblong-ovate, gradually narrowed toward apex, commonly cuspidate, rather broadly scarious-margined; inner bracts equaling or slightly exceeding the calyx tube, broadly scarious-margined, obtusely acuminate, minutely mucronulate or muticous; calyx ca. 11-14 mm long, funnelform, the tube ca. 7-9 mm long, sparsely covered between the nerves with fairly long hairs; calyx limb ca. 4-5 mm broad, pink or purple, rather distinctly 10-lobed, the bare or hairy nerves reaching the margin or scarcely excurrent; petals pink. Fl. July-September.

Stony mountain slopes, at altitudes of 1500-3000 m. — Soviet Central Asia: Pam.-Al. (N. slopes of the Alai and Turkestan ranges, the Zeravshan River basin, the Nuratau Range, the W. spur of the Gissar Range). Endemic (?). Described from the N. slopes of the E. end of the Turkestan Range (in the vicinity of the village of Kekh in the area of the watershed of the upper Isfara and Kokh rivers). Type in Leningrad.

Note. *A. erythraeum*, as well as the two preceding species, *A. Majeavianum* Rgl. and *A. gaudanense* Czerniak., occupy an intermediate position between the sections *Staticopsis* Boiss. and *Tragacanthina* Bge., in that they display a more pronounced difference in the shape and consistency of spring and summer leaves than in usual for species of the section *Staticopsis*.

36. *A. langaricum* O. et B. Fedtsch. in Tr. Petersb. obschch. estestvoisp. XXXV, 3 (1907) 194 (Bot. zhurn. 6, 1906) and in Tr. Bot. Sada, XXVIII (1907) 56; Fedch. O and B. Perech. rast. Turk. 5, 189.

Rather compactly pulvinate, subhemispherical shrubs, 15-30 cm in diameter; summer leaves glaucescent-green, applanate-triquetrous, linear-subulate, rigid, 2-3 cm long and ca. 0.5 mm broad, acerose, glabrous, the margin ciliate-scabrous at the very base, smooth elsewhere; spring leaves only slightly shorter, very minutely ciliate-scabrous on the margin, otherwise alike; scapes slightly exceeding the leaves, ca. 4-8 cm long, simple, densely pubescent; spikes terminal, ca. 1.5-2 cm long, rather compactly 5-10-spiculed, rather distinctly 2-ranked; spicules ca. 11 mm long, all single-flowered; bracts glabrous; outer bract ca. 5-6 mm long, but slightly shorter than the inner ones, oblong-ovate, long-acuminate, cuspidate, rather broadly scarious-margined; inner bracts equaling or slightly exceeding the calyx tube, very broadly scarious-margined, obtusely acuminate, minutely mucronulate; calyx ca. 10 mm long, funnelform, the tube ca. 6 mm long, sparsely hairy between the nerves; calyx limb ca. 4 mm broad, purple, rather distinctly 10-lobed, the bare nerves reaching the margin; petals pink. Fl. July.

Stony mountain slopes at altitudes of about 3000 m. — Soviet Central Asia: Pam.-Al. (Alai Range). Endemic. Described from the vicinity of the village of Lyangar on the upper Isfairam River. Type in Leningrad.

Note. A species apparently affiliated to *A. erythraeum* Bge., distinguishable by its narrower leaves, long outer bracts, and the somewhat shorter calyx.

37. *A. Varivtzevae* Czerniak. sp. n. in Addenda XVII, 738.

Rather compactly pulvinate subhemispherical shrub, 15-30 cm in diameter; summer leaves pale green, applanate-triquetrous, linear-subulate, rigid, 1-1.5 cm long and ca. 0.5-1 mm broad, acerose, rather densely and minutely puberulous above or glabrous, the margin minutely ciliate-scabrous; spring leaves slightly shorter, otherwise alike; scapes slightly exceeding the leaves, 3-5 cm long, simple, glabrous or minutely puberulous; spikes terminal, ca. 1.5-2 cm long, rather compactly 5-10-spiculed, more or less distinctly 2-ranked; spicules ca. 11 mm long, all single-flowered; bracts glabrous; outer bract ca. 4 mm long, about half as long as the inner bracts, ovate, gradually acuminate, mucronate, narrowly scarious-margined; inner bracts equaling or slightly exceeding the calyx, very broadly scarious-margined, obtusely-acuminate or round-tipped, minutely mucronulate or muticous; calyx ca. 10 mm long, funnelform, the tube ca. 6 mm long, sparsely hairy between the nerves; calyx tube ca. 4 mm broad, purple, rather distinctly 10-lobed, the bare nerves reaching the margin; petals bright pink. Fl. July-August.

Stony mountain slopes at altitudes of about 3000-4000 m. — Soviet Central Asia: Pam.-Al. (Pamir). Endemic (?). Described from the Lake Zorkul' area and from the Yamg Pass. Type in Leningrad.

Note. A species apparently affiliated to *A. langaricum* O. et B. 342 Fedtsch., distinguishable by its much shorter broad and normally pubescent leaves and the short outer bracts.

38. **A. laxum** Czerniak. in Bot. Mat. Gerb. Bot. Sada, IV (1923, May) 67. — *A. talassicum* Korov. in Tr. Turk. nauchn. obshch. I (1923) 83.

Rather compactly pulvinate subhemispherical shrubs, 15-25 cm in diameter; summer leaves glaucescent-green, applanate-triquetrous, linear-subulate, rigid, (1.5) 2-2.5 (3.5) cm long and ca. 1.5 mm broad, acerose, glabrous, the margin (sometimes merely at base) minutely ciliate-scabrous; spring leaves slightly shorter and scarcely broader, otherwise alike; scapes greatly exceeding the leaves, 15-30 cm long, with long slender branches in upper part, glabrous; spikes loose, the joints sometimes half as long again to twice as long as the spicules; spicules borne on the main axis and on the lateral branches, ca. 11-12 mm long, all single-flowered; bracts glabrous; outer bract ca. 4 mm long, about half as long as the inner bracts, ovate, acuminate, usually minutely mucronulate, rather narrowly scarious-margined; inner bracts equaling or slightly exceeding or shorter than the calyx tube, broadly scarious-margined, subobtusely acuminate, mucronate or muticous; calyx ca. 10-11 mm long, funnelform, the tube ca. 6 mm long, rather sparsely hairy in upper part between the nerves; calyx limb ca. 4-5 mm broad, white, rather distinctly 10-lobed, the bare nerves nearly reaching the margin; petals bright pink. Fl. July-August (September).

Stony mountain slopes, at altitudes of 2000-2500 (?) m. — Soviet Central Asia: Tien Shan (Talass and Kirghiz Ala Tau ranges in the area of the middle reaches of the Talass R.; also the Kokomoren R. basin — Western Karakol' and Dzhungol river valleys — in Central Tien Shan). Endemic. Described from the areas indicated. Type and paratype in Leningrad.

39. **A. tenuiflorum** Boiss. Diagn. ser. 1, VII (1846) 78 et in DC. Prodr. XII, 630, p.p. excl. syn. M.B. et Jaub. et Sp.; Bge. in Mem. Acad. Sc. Petersb. VII ser. XVIII, 2, 32 et Boiss. Fl. or. IV, 834, p.p. excl. specim. Hohenack. e Suwant; Kuzn. in Mat. Fl. Kavk. IV, 1, 181; Grossg. Fl. Kavk. ed. 1, II, 217 in Oprod. rast. Kavk. 593. — *Statice acerosa* Hohenack. in Bull. Soc. Nat. Mosc. VI (1833) 227, non Willd. — *S. acerosa* Ldb. Fl. Ross. III, 470, p.p. non Willd. nec. M.B. — *S. Echinus* L. Sp. pl. (1753) 276, p.p. quoad syn. Buxb. — Ic.: Buxb. Pl. minus cogn. cent. II, tab. 10. — Exs.: Hohenack. pl. exs. cauc.; Kolenati, Fl. transcauc. No. 1736.

343 Rather compactly pulvinate subhemispherical shrubs, up to 10-15 (?) cm in diameter; summer leaves pale glaucous, applanate-triquetrous, linear-lanceolate to linear-subulate, rigid, (1) 1.5-2 (3) cm long and ca. 1 mm broad (up to 1.5 mm at base), acerose, glabrous, the margin minutely ciliate-scabrous; spring leaves markedly short and scarcely broader than the summer leaves, otherwise alike; scapes greatly exceeding the leaves, 15-30 cm long, with 2-5 rather long branches in upper part, rarely simple, glabrous; spikes loose, the intervals from about equaling to markedly exceeding the spicules; spicules borne on the terminal straight and rather

firm (not very brittle) part of the scape and usually in smaller number on the branches, ca. 10-11 mm long, all single-flowered; bracts glabrous; outer bract ca. 4-5 mm long, slightly shorter than the inner bracts, ovate-lanceolate, gradually narrowed toward apex, mucronate, narrowly scarious-margined; inner bracts slightly shorter than or equaling the calyx tube, very broadly scarious-margined (nearly scarious throughout), obtusely acuminate, mucronate to minutely mucronulate; calyx ca. 9-10 mm long, funnelform, the tube ca. 6 mm long, sparsely hairy between the nerves; calyx limb ca. 3 mm broad, white, distinctly 10-lobed, the bare nerves not quite reaching the margin or reaching it (in the case of the often more or less emarginate main lobes); petals pink. Fl. May-June.

Dry fine-earth and stony slopes in low mountains. — Caucasus: E. Transc. Endemic. Described from the vicinity of Kirovabad. Type in Geneva.

40. **A. lepturoides** (Jaub. et Sp.) Boiss. Diagn. ser. 1, VII (1846) 77 et in DC. Prodr. XII, 630; em. (corr. charact. nonn.) Bge. in Mem. Acad. Sc. Petersb. VII ser. XVIII, 2 (1872) 49; Boiss. Fl. or. IV; 842; Kuzn. in Mat. Fl. Kavk. IV, 1 (1902) 194; Grossg. Fl. Kavk. ed. I, III, 216 and Opred. rast. Kavk. 592. — *Statice lepturoides* Jaub. et Sp. Ill. pl. or. I (1842-1843) 163, 170 et in Ann. sc. nat. 2 ser. XX (1843) 254, p.p. excl. specim. Hohenack. — *S. acerosa* M.B. Fl. taur.-cauc. I (1808) 252, p.p. excl. syn. non Willd.; Ldb. Fl. Ross. III, 470, p.p. excl. syn. Hohenack. et Boiss. et specim. Hohenack. — Ic.: Jaub. et Sp. l.c. tab. 95.-Exs.: Herb. Fl. Cauc. No. 441.

344 Rather compactly pulvinate subhemispherical shrubs, up to 10-15 (?) cm in diameter; summer leaves pale glaucous, applanate-triquetrous, linear-lanceolate to linear-subulate, rigid, (1) 1.5-2.5 (3.5) cm long and ca. 1-1.5 mm broad (up to 2 mm at base), acerosa, glabrous, the margin minutely ciliate-scabrous, spring leaves markedly shorter and scarcely broader, otherwise alike; scapes greatly exceeding the leaves, 15-20 cm long, simple, rarely with a single lateral branch, glabrous or in lower part very sparsely puberulous; spikes loose (the lower joints slightly exceeding, the upper ones about equaling, the spicules); spicules borne on the upper often flexuous and brittle part of the scape, ca. 10-11 mm long, all single-flowered; bracts glabrous; outer bract ca. 7-8 mm long, scarcely shorter to markedly longer than the inner bracts, triangular-lanceolate, gradually acuminate from the base, cuspidate, narrowly scarious-margined; inner bracts equaling or slightly exceeding the calyx tube, broadly scarious-margined, obtusely acuminate, sometimes scarcely bilobate, mucronate; calyx ca. 9-10 mm long, funnelform, the tube ca. 7 mm long, rather sparsely pubescent between the nerves; calyx limb ca. 2.5-3 mm broad, white, obscurely 10-lobed or subtruncate, the nerves hairy in lower part and mostly nearly reaching the margin; petals pink. Fl. May-June (Plate XVIII, Figures 2, 2a).

Dry fine-earth and stony slopes in low mountains. — Caucasus: E. Transc. Endemic. Described from the vicinity of Tbilisi. Type in Paris (?).

Note. N.I. Kuznetsov (l.c., p. 196) describes a striking form — var. *graminifolium* Kusn., with "quite soft herbaceous filiform-subulate" leaves. This form was also collected near Tbilisi ("hills by

the Vere River") and does not, according to Kuznetsov, differ in other characteristics from the typical form.

41. **A. Fominii** Kusn. in Mat. Fl. Kavk. IV, 1 (1902) 186 ("Fomini"); Grossg. Fl. Kavk., ed. 1, III, 217 and Opred. rast. Kavk. 593.— Exs.: Pl. or. exs. No. 369.

Rather compactly pulvinate subhemispherical shrubs, up to 10-15 (?) cm in diameter; summer leaves pale glaucous, applanate-triquetrous, linear-lanceolate to linear-subulate, rigid, (1) 1.5-2 (3) cm long and ca. 1-1.5 mm broad, acerose, glabrous, the margin minutely ciliate-scabrous; spring leaves markedly shorter and scarcely broader, otherwise alike; scapes greatly exceeding the leaves, 10-15 cm long, simple, rarely with a single lateral branch, sparsely puberulous to glabrate, spikes loose (the lower joints slightly exceeding, the upper ones about equaling, the spicules); spicules borne on the upper strongly flexuous and brittle part of the scape, ca. 11-12 mm long, all single-flowered; bracts glabrous; outer bract ca. 7-8 mm long, slightly shorter to markedly longer than the inner bracts, triangular-lanceolate, gradually acuminate from base, cuspidate, narrowly scarious-margined; inner bracts equaling or slightly exceeding the calyx
345 tube, broadly scarious-margined, obtusely acuminate, mucronate; calyx ca. (8?) 10-11 mm long, funnelform, the tube ca. 7 mm long, rather sparsely hairy between the nerves; calyx limb ca. 4 mm broad, white, distinctly 10-lobed, the nerves hairy in lower part or glabrous, reaching the margin or nearly so; petals pink. Fl. May-June.

Dry fine-earth and stony slopes in low mountains.—Caucasus: E. Transc. Endemic. Described from the Shekinskii upland (El'dar and Boz-Dag). Type in Leningrad.

Note. A critical species, very closely resembling *A. lepturoides* (Jaub. et Sp.) Boiss. As far as can be ascertained from the limited material at hand, about the only distinguishing characteristics are the scarcely longer calyx with a somewhat broader and distinctly 10-lobed limb, and mostly scarcely pubescent (not glabrous) scapes. The outer bract (Kuznetsov attached importance to its relative length) of *A. Fominii* is not always shorter than the inner bracts and, just as in the case of *A. lepturoides*, it often equals or exceeds them. Further study of this pair of species is needed on more ample material and on natural populations in the field.

42. **A. araxanum** Bge. in Mem. Acad. Sc. Petersb. VII ser. XVIII, 2 (1872) 33; Boiss. Fl. or. IV, 834; Kuzn. in Mat. Fl. Kavk. IV, 1, 183.— *A. Trautvetteri* Kusn. in Mat. Fl. Kavk. IV, 1 (1902) 183; Grossg. Fl. Kavk. ed. 1, III, 217 and Opred. rast. Kavk. 593.

Rather loosely pulvinate subhemispherical shrubs, up to 20-30 (?) cm in diameter; summer leaves greenish-glaucous, applanate-triquetrous, linear-subulate, rigid, (2) 3-4 (5.5) cm long and ca. 1-1.5 mm broad, acerose, glabrous, the margin minutely ciliate-scabrous; spring leaves flatter, markedly shorter and broader (up to 2 mm broad), otherwise alike; scapes greatly exceeding the leaves, up to 15-20 cm long, commonly with 1 or 2 fairly long branches, quite glabrous; spikes loose, the joints about equaling or slightly shorter than the spicules; spicules borne on the upper strongly flexuous and brittle part of the scape, ca. 11-14 mm long, all single-flowered; bracts glabrous; outer bract ca. 7-10 mm long, from very slightly shorter to markedly longer than the inner bracts and sometimes

nearly reaching the middle of the calyx limb, ovate-lanceolate, gradually acuminate nearly from base, acerose, rather narrowly scarious-margined; inner bracts equaling or slightly exceeding the calyx tube; very broadly scarious-margined, obtusely acuminate or round-tipped, sometimes
346 irregularly toothed, with an occasional dorsal mucro; calyx ca. 10-13 mm long, funnellform, the tube ca. 6-8 mm long, sparsely hairy between the nerves; calyx limb ca. 4-5 mm broad, white, rather distinctly 10-lobed, the nerves bare or slightly hairy at base, reaching the margin or scarcely excurrent; petals bright pink. Fl. May-July.

Stony mountain slopes, at altitudes of about 800-1500 m. — Caucasus: S. Transc. (S. part). **Gen. distr.:** Arm.-Kurd. Described from the Araks River valley and the Mt. Khoi area. Type in Leningrad.

Note. The relative length of the outer bract (used for distinguishing *A. Trautvetteri* Kusn.) is not a reliable characteristic, as it is subject to variation even within the same specimen. Apparently, of rather common occurrence is a form with a small calyx (about 10 mm long), *f. microcalyx* Lincz. which does not differ from the typical form in other characteristics.

43. **A. caryophyllaceum** Boiss. Diagn. ser. 1, VII (1846) 78, p.p., excl. var. *brachystachyum* Boiss. et in DC. Prod. XII, 630, p.p. excl. syn. plur. et Fl. or. IV, 838; Bge. in Mem. Acad. Sc. Petersb. VII ser. XVIII, 2, 36, em.; Grossg. Opred. rast. Kavk. 593. — Exs.: Kotschy, Pl. alepp. kurd. moss. 1841, No. 368 (typus! sub *Statice caryophyllacea* Boiss. et Hoh. nomen) et It. cilic.-kurd. 1859. No. 315.

Rather loose pulvinate subhemispherical shrubs, up to 20-30 (?) cm in diameter; summer leaves green or glaucescent-green, applanate-triquetrous, linear-subulate, rigid, 2.5-4 cm long and ca. 1-1.5 mm broad, acerose, sparsely and minutely puberulous, the margin minutely ciliate-scabrous; spring leaves slightly shorter and scarcely broader, otherwise alike; scapes greatly exceeding the leaves, ca. 10-15 cm long, simple, sparsely and minutely puberulous; spikes fairly loose, the joints usually shorter than the spicules; spicules 10-15, borne on the upper $\frac{2}{3}$ - $\frac{3}{4}$ of the suberect or more or less flexuous scape, 14-15 mm long, all single-flowered; outer bract glabrous or sparsely and minutely hairy, ca. 7-9 mm long, from slightly shorter than to about as long as the inner bracts, ovate-lanceolate, gradually acuminate nearly from base, cuspidate, rather narrowly scarious-margined; inner bracts rather densely covered with short hairs, equaling or slightly exceeding the calyx, very broadly scarious-margined, gradually acuminate or obtusely round-tipped, cuspidate; calyx
347 ca. 13-14 mm long, funnellform, the tube ca. 7-8 mm long, rather densely covered with long hairs between the nerves; calyx limb ca. 5-6 mm broad, white, obscurely 10-lobed, the nerves appressed-hairy in lower part, reaching the margin; petals bright pink. Fl. June-July.

Stony slopes in the intermediate mountain zone. — Caucasus: S. Transc. **Gen. distr.:** Arm.-Kurd. Described from Mt. Gara in Kurdistan. Type in Geneva; isotype in Leningrad.

44. **A. armenum** Boiss. et Huet in Boiss. Diagn. ser. 2, IV (1859) 64 et Fl. or. IV, 839, an p.p. excl. β . *Balansae* Boiss. ?; Bge. in Mem. Acad. Sc. Petersb. VII ser. XVIII, 2, 36. — *A. armenum* var. *typica*

et var. *puberula* Trautv. in Tr. Bot. Sada, II (1873) 581.— *A. armenum* var. *Balansae* Kusn. in Mat. Fl. Kavk. IV, 1 (1902) 187, non Boiss.— *A. Balansae* Grossh. Fl. Kavk. ed. 1, III (1932) 217 and Opred. rast. Kavk. 593, non Boiss. nec Bge.— Ic.: Möllers Deutsche Gärtner-Zeit. XXVIII (1913) 229.

Rather compactly pulvinate subhemispherical shrubs, up to 15-20 (40) cm in diameter; summer leaves pale glaucous or greenish-glaucous, flat or nearly so, linear-lanceolate, rigid, (1) 1.5-2.5 (4) cm long and ca. 1.5-2 mm broad, acerose, glabrous, the margin minutely ciliate-scabrous; spring leaves usually markedly shorter and broader, sometimes up to 3-4 mm broad, otherwise alike; scapes greatly exceeding the leaves, up to 10-15 (25) cm long, simple, rather densely puberulous to glabrate; spikes rather loose, the joints usually shorter than the outer bracts; spicules 10-15 (20), borne on the upper $2/3$ - $3/4$ of the rather strongly flexuous scape, 14-15 mm long, all single-flowered; bracts all glabrous or the inner ones slightly hairy on the midrib; outer bract ca. 7-8 mm long, from $3/4$ the length of to equaling the inner bracts, ovate-lanceolate, gradually acuminate nearly from base, cuspidate, rather narrowly scarious-margined; inner bracts equaling or slightly exceeding the calyx tube, very broadly scarious-margined, rather gradually acuminate or obtusely round-tipped, cuspidate; calyx ca. 13-14 mm long, funnelform, the tube ca. 7-8 mm long, rather densely covered between the nerves with fairly long hairs; calyx limb ca. 5-6 mm broad, white, obscurely 10-lobed, the nerves appressed-hairy in lower part, reaching the margin or nearly so or rarely excurrent; petals bright pink. Fl. May-July.

Stony slopes in the lower and intermediate mountain zones.— Caucasus: S. Transc. **Gen. distr.:** Bal.-As. Min. (E. part), Arm.-Kurd. Described from the vicinity of Erzurum. Type in Geneva; isotype in Leningrad.

Note. A species belonging, together with *A. araxanum* Bge. and *A. caryophyllaceum* Boiss., to the critical *A. acerosum* (Willd.) Boiss. cycle of Asia Minor.

- 348 45. **A. Hohenackeri** (Jaub. et Sp.) Boiss. Diagn. ser. 1, VII (1846) 75 et in DC. Prodr. XII (1848) 628 (an p.p. excl. β . subsessile Boiss.?) et Fl. or. IV, 834; Bge. in Mem. Acad. Sc. Petersb. VII ser. XVIII, 2 (1872) 41; Kuzn. in Mat. Fl. Kavk. IV, 1, 189; Fedch. O. and B. Perech. rast. Turk. 5, 190, p.p.; Grossg. Fl. Kavk. ed. 1, III, 217 and Opred. rast. Kavk. 592.— *Statice Hohenackeri* Jaub. et Sp. Ill. pl. or. I (1842-1843) 162, 167 et in Ann. sc. nat. 2 ser. XX (1843) 252; Ldb. Fl. Ross. III, 469, p.p. quoad specim. talysch.— *S. tenuifolia* Jaub. et Sp. l.c. (1842-1843) 162 et l.c. (1843) 251.— *S. aciphylla* Jaub. et Sp. l.c. (1842-1843) 162 et l.c. (1843) 251.— *S. horrida* Girard in Ann. sc. nat. 3 ser. II (1844) 331.— *S. Echinus* M.B. Fl. taur.-cauc. I (1808) 251, non L.— *S. Echinus* Hohenack. in Bull. Soc. Nat. Mosc. XI (1838) 262, non L.— *S. acerosa* Hohenack. l.c. 262, non Willd. nec. M.B.— Ic.: Jaub. et Sp. l.c. (1842-1843) tab. 92.— Exs.: Hohenack. pl. exs. cauc.

Rather compactly pulvinate subhemispherical shrubs, up to 20-30 (?) cm in diameter; summer leaves glaucous-green or pale glaucous, applanate-triquetrous, linear-subulate, rigid, (1) 1.5-2 cm long and ca. 0.5-1 mm broad, acerose, glabrous, the margin ciliate-scabrous; spring leaves slightly shorter and broader, otherwise alike; scapes mostly fairly

markedly (rarely only slightly) exceeding the leaves, (3) 5-10 cm long, with 1-3 rather short branches at the top, rather gently and minutely puberulous; spikes loose, distinctly 2-ranked, 5-10-spiculed, the joints about equaling the bracts; spicules ca. 11-13 mm long, all single-flowered; bracts glabrous; outer bract ca. 4-5 mm long, about two-thirds the length of the inner ones, oblong-ovate, gradually acuminate, mucronate, rather narrowly scarious-margined; inner bracts about equaling the calyx tube, broadly or very broadly scarious-margined, obtusely acuminate or round-tipped, mucronate or muticous; calyx ca. 10-12 mm long, funnelform, the tube ca. 6-7 mm long, rather densely covered between the nerves (and toward apex also on the nerves) with long hairs; calyx limb ca. 4 mm broad, white, rather distinctly 10-lobed, the nerves hairy in lower part, reaching the margin or scarcely excurrent. Fl. June-August.

Stony mountain slopes, at altitudes of 1200-2400 m. — Caucasus: E. and S. Transc. (S. part), Tal. **Gen. distr.:** Arm.-Kurd., Iran. (Elburz). Described from Talysh (Zuvand). Type in Paris; isotype in Leningrad.

349 **Note.** A polymorphic species, needing further critical study. Within the scope adopted here, in accordance with earlier authors, it apparently contains a number of more restricted forms. Possibly to one of these refers the name *Statice juniperina* Willd. which Boissier, who had seen the original specimens in Willdenow's herbarium, placed (l.c., 1848) among the synonym of his *A. Hohenackeri* β . *subsessile* Boiss.

Reports of this species for Soviet Central Asia (Turkmenistan), based on Karelin's collections, have not so far been confirmed. It is most likely that these collections were not made in "Turkmenistan" but in northern Iran, on the Elburz Range.

46. **A. schemachense** Grossh. in Tr. po geobot. obsled. pastb. Azerb., ser. A, No. 7 (1931) 99; Grossg. Fl. Kavk., ed. 1, III, 216 and Oprod. rast. Kavk. 592. — Ic.: Grossg. l.c., 1931, Plate VIII.

Rather compactly pulvinate subhemispherical shrubs up to 20-30 (?) cm in diameter; summer leaves pale glaucous; applanate-triangular, linear-subulate or narrowly lance-subulate, rigid, 0.7-1 (1.5) cm long and ca. 1 mm broad, acerose, glabrous, the margin minutely ciliate-scarious; spring leaves slightly shorter, otherwise alike; scapes scarcely to slightly exceeding the leaves, up to 2-3 (?) cm long, simple or sometimes few-branched, sparsely and minutely puberulous; spikes loosely 1-3 (4) spiculed; spikelets ca. (9) 11-12 mm long, all single-flowered; bracts glabrous; outer bract ca. 4-5 mm long, about two-thirds (half?) as long as the inner bracts, oblong-ovate, gradually acuminate, mucronate, rather narrowly scarious-margined; inner bracts about equaling the calyx tube, broadly or very broadly scarious-margined, obtusely acuminate or round-tipped, mucronate; calyx ca. (8) 10-11 mm long, funnelform, the tube ca. 6-7 mm long, rather sparsely hairy between the nerves; calyx limb ca. 4 mm broad, white, rather distinctly 10-lobed, the main lobes distinctly emarginate, the nerves slightly hairy in lower part, reaching the margin or scarcely excurrent in the notches; petals pink. Fl. June-July (?).

Stony mountain slopes. — Caucasus: E. Transc. (NE part). Endemic. Described from the vicinity of Shemakh. Type in Tbilisi.

Note. I do not, unfortunately, know the typical material of this species. The extremely short description (Grossg., l.c.) has here been supplemented

merely on the basis of two herbarium specimens collected in the Gil'gin-Chai River valley. (July 25, 1937, I. Karyagin). The author of the species considered *A. Hohenackeri* (Jaub. et Sp.) Boiss. as its closest relative. However, such a characteristic as the distinctly emarginate main (nerved) lobe of the calyx limb, which has been observed on Karyagin's specimens, also brings this species close to *A. tenuiflorum* Boiss.

- 350 47. *A. glumaceum* (Jaub. et Sp.) Boiss. Diagn. ser. 1, VII (1846) 75 et in DC. Prodr. XII, 629 et Fl. or. IV, 835; Bge. in Mem. Acad. Sc. Petersb. VII ser. XVIII, 2 (1872) 41; Kuzn. in Mat. Fl. Kavk. IV, 1, 191; Grossg. Fl. Kavk. ed. 1, III, 217 and Opred. rast. Kavk. 592.—*A. glumaceum* var. *typica* Trautv. in Tr. Bot. Sada, IV (1876) 180.—*A. glumaceum* var. *breviscapa* Trautv. in Tr. Bot. Sada, II (1873) 582.—*Statice glumacea* Jaub. et Sp. Ill. pl. or. I (1842-1843) 162, 166 et in Ann. sc. nat. 2 ser. XX (1843) 251, excl. syn. Tourn.—*S. Hohenackeri* Ldb. Fl. Ross. III (1847-1849) 469, p. p. quoad. specim. ararat. non Jaub. et Sp.—Ic.: Jaub. et Sp. l. c. tab. 91.

Rather loosely pulvinate subhemispherical shrubs, 15-30 cm in diameter; summer leaves green, applanate-triquetrous, linear-subulate, rigid, (1) 2-3 (4.5) cm long and ca. 1 mm broad, acerose, glabrous or more or less densely covered in lower part (especially at the dilated base) with short hairs, rarely the entire surface short-hairy, the margin minutely ciliate-scabrous; spring leaves slightly shorter and broader, glabrous except at base, the margin minutely ciliate-scabrous; scapes greatly or rarely (var. *breviscapum* Trautv.)—slightly exceeding the leaves, (2) 5-10 cm long, with 1-2 very short branches at the top, more or less densely and minutely puberulous, rarely (var. *glabrum* Lincz.) glabrous; spikes terminal, ca. 2-2.5 cm long, rather compactly 5-10-spiculed, distinctly 2-ranked; spicules ca. 13-15 mm long, all single-flowered; bracts densely subvelutinous-puberulous to glabrous or nearly so; outer bract ca. 6-8 mm long, usually very slightly shorter than or nearly equaling the inner bracts, oblong-ovate, very gradually acuminate, terminating in a cusp 1-2 mm long, rather broadly scarious-margined; inner bracts markedly exceeding the calyx, very broadly scarious-margined to nearly scarious throughout, subobtusely acuminate, with a slender cusp 1-1.5 mm long; calyx ca. 12-14 mm long, funnelform, the tube ca. 7-8 mm long, rather sparsely covered between the nerves (except in lower part) with short hairs; calyx limb ca. 5 mm broad, white, often narrowly purple-tinged along the nerves, rather distinctly 10-lobed, the bare or hairy nerves reaching the margin or slightly excurrent; petals bright pink. Fl. July-September. (Plate XVIII, Figures 1, 1a).

Stony mountain slopes in the subalpine and alpine zones.—Caucasus: S. Transc. **Gen. distr.:** Arm.-Kurd. Described on the basis of Tournefort's collections from "Armenia" (apparently from Mt. Ararat). Type in Paris.

48. *A. sahendicum* Boiss. et Buhse in Nouv. Mem. Soc. Nat. Mosc. XII (1860) 183; Bge. in Mem. Acad. Sc. Petersb. VII ser. XVIII, 2 (1872) 42; Boiss. Fl. or. IV, 835; Grossg. Opred. rast. Kavk. 593.—*A. glumaceum* var. *sahendicum* Kusn. in Mat. Fl. Kavk. IV, 1 (1902) 193, in footnote.

Rather loosely pulvinate subhemispherical shrubs, 15-30 (?) cm in diameter, summer leaves green, applanate-triquetrous, linear-subulate, glabrous, 1.5-3 cm long and ca. 1 mm broad, acerose; the margin minutely ciliate-scabrous; spring leaves slightly shorter and scarcely broader, otherwise alike; scapes considerably exceeding the leaves, (3) 5-8 cm long, simple (or rarely few-branched?), glabrous and smooth; spikes terminal, ca. 2-2.5 cm long, rather loosely 3-7-spiculed, more or less distinctly 2-ranked; spicules ca. 13-15 mm long, all single-flowered; bracts glabrous, reddish-brown; outer bract ca. 4-5 (7) mm long, about one-half to two-thirds as long as the inner bracts, ovate to oblong-ovate, subobtusely acuminate, terminating in a cusp ca. 0.5 mm long, rather narrowly scarious-margined; inner bracts equaling or slightly exceeding the calyx tube, very broadly scarious-margined to nearly scarious throughout, usually obtusely acuminate or round-tipped, the cusp usually less than 0.5 mm long; calyx ca. 12-14 mm long, funnelform, the tube ca. 7-8 mm long, sparsely covered between the nerves (except in lower part) with rather short hairs; calyx limb ca. 5 mm broad, white, rather distinctly 10-lobed, the bare nerves reaching the margin; petals bright pink. Fl. July-September (?).

Stony mountain slopes in the subalpine and alpine zones. — Caucasus: S. Transc. (S. part). **Gen. distr.:** Arm.-Kurd., Iran. (Elburz?). Described from NW Iran (from Mt. Sakhend, south of Tebriz). Type in Leningrad.

Note. The Caucasian specimens of this species known to me differ from the type in the outer bracts, which are longer (up to 7 mm) and terminate in a longer cusp, but otherwise resemble the type rather closely. I have not seen any Iranian specimens of *A. sahendicum* except the typical ones.

49. *A. pulchellum* Korov. in Bot. Mat. Gerb. Bot. Sada, III (1922) 191, incl. f. *condensatum* Korov. — ? *A. kutschanense* Rech. f. in Österr. Bot. Zeitschr. XCV, 4 (1949) 424.

352 Rather loosely pulvinate subhemispherical shrubs, 15-25 cm in diameter; summer leaves glaucescent-green, applanate-triquetrous, linear-subulate, rigid, (1.5) 2-2.5 (3) cm long and ca. 1 mm broad, acerose, glabrous, the margin minutely ciliate-scabrous; spring leaves markedly shorter and slightly broader, otherwise rather similar; scapes greatly exceeding the leaves, 8-15 cm long, simple or with few very short-branched branches at the very top, glabrous; spikes terminal, ca. 2 cm long, compactly 6-8 (10)-spiculed, distinctly 2-ranked; spicules ca. 12-14 mm long, all single-flowered; bracts glabrous; outer bract ca. 5-6 mm long, about one-half to two-thirds as long as the inner bracts, broadly and irregularly ovate or subobovate, subobtusely acuminate, mucronate or muticous, rather broadly scarious-margined; inner bracts greatly exceeding the calyx tube, sometimes reaching the middle of the limb, broadly scarious-margined, broadly round-tipped and often slightly emarginate, muticous or rarely minutely mucronulate; calyx ca. 11-13 mm long, funnelform, the tube ca. 7-8 mm long, rather densely covered between the nerves with long hairs; calyx limb ca. 5 mm broad, white, rather distinctly 10-lobed, the nerves reaching the margin, rather densely covered in lower part with long hairs or rarely bare; petals bright pink. Fl. May-June.

Stony mountain slopes, at altitudes of about 1300-1500 m. — Soviet Central Asia: Mtn. Turkm. (Centr. Kopet Dagħ). **Gen. distr.:** ? Iran. (N. Khurasan). Described from the vicinity of Gaudan. Type in Leningrad.

Note. Closely related to the Iranian *A. Bodeanum* Bge. described from the area between Teheran and Shakhruđ, and this in turn is related to the S. Transcaucasian and W. Iranian *A. sahendicum* Boiss. et Buhse.

50. **A. blandum** Czerniak. in *Izv. Glavn. Bot. Sada*, XXIX, 1-2 (1930) 148 and in Fedde, *Repert. sp. n.* XXVII (1930) 275.

Rather compactly pulvinate, low, prostrate shrubs, 15-40 cm in diameter; summer leaves glaucous-green, applanate-triquetrous, linear-subulate, fairly rigid, 0.5-1 (1.5) cm long and ca. 1 mm broad, acerose, glabrous, the margin minutely ciliate-scabrous; spring leaves slightly shorter and broader, otherwise alike; scapes greatly exceeding the leaves, ca. 5-8 cm long, simple or with few very short branches at the top, glabrous; spikes terminal, ca. 2 cm long, compactly 5-6 (12)-spiculed, distinctly 2-ranked; spicules ca. 12-13 mm long, all single-flowered; bracts glabrous; outer bract ca. 7 mm long, about two-thirds as long as the inner bracts, broadly ovate, subobtusely acuminate, mucronate, rather
355 broadly scarious-margined; inner bracts markedly exceeding the calyx tube, sometimes nearly reaching the middle of the limb, broadly scarious-margined, obtusely acuminate or round-tipped, minutely mucronulate or muticous; calyx ca. 11-12 mm long, funnelform, the tube ca. 6-7 mm long, rather densely covered between the nerves with long hairs; calyx limb ca. 5 mm broad, pale pink, rather distinctly 10-lobed, the bare nerves reaching the margin or scarcely excurrent; petals bright pink. Fl. June.

Stony mountain slopes, at altitudes of about 1800-2000 m. — Soviet Central Asia: Mtn. Turkm. (Centr. Kopet Dagħ in the Gaudan-Firyuza area). **Gen. distr.:** Iran. (N. Khurasan). Described from the area indicated. Type in Leningrad.

Note. A species undoubtedly akin to *A. pulchellum* Korov. and apparently also closely related to the Iranian *A. Faustii* Trautv. described from the area between Gorgan and Shakhruđ. It differs from both in, besides other characteristics, the pale pink (not white) calyx limb.

51. **A. Raddeanum** Czerniak. in *Izv. Glavn. Bot. Sada*, XXIX, 1-2 (1930) 149 and in Fedde, *Repert. sp. n.* XXVII (1930) 276.

Rather loosely pulvinate subhemispherical shrubs, up to 30-40 (?) cm in diameter; summer leaves glaucescent-green, applanate-subulate, rigid, (1.5) 2-3 (5) cm long and ca. 1.5 mm broad (up to 2 mm at base), acerose, glabrous, the margin minutely ciliate-scabrous; spring leaves markedly shorter and broader (up to 3 mm broad at base), otherwise rather similar; scapes greatly exceeding the leaves, 15-25 cm long, simple or with 2 or 3 short branches, glabrous; spikes terminal, 2-4 cm long, loosely 5-10-spiculed, rather distinctly 2-ranked; spicules ca. 12-13 mm long, all single-flowered; bracts glabrous; outer bract ca. 6-7 mm long, about two-thirds as long as the inner bracts, oblong-ovate, rather gradually narrowed toward apex, mucronate, rather broadly scarious-margined; inner bracts markedly exceeding the calyx tube, sometimes nearly reaching the middle of the limb, very broadly scarious-margined, obtusely acuminate or round-tipped, very minutely mucronulate or muticous; calyx ca. 10-12 mm long,

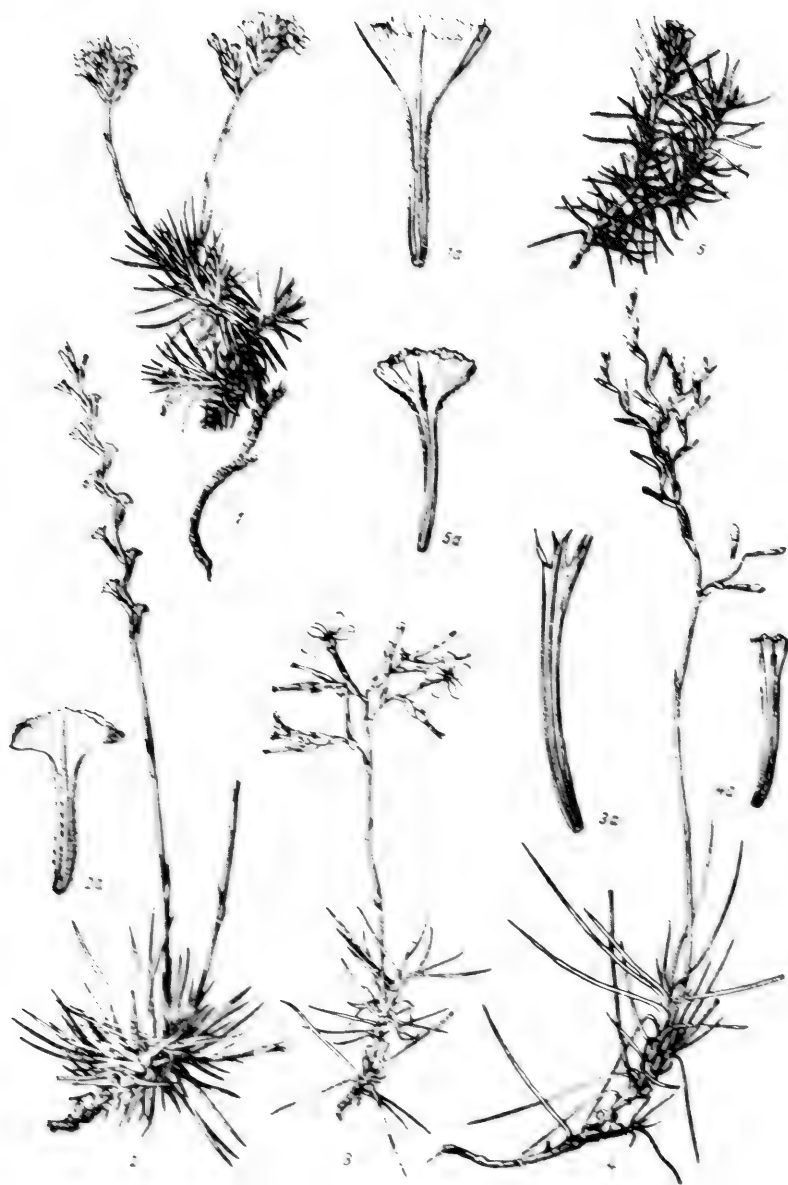


Plate XVIII

1. *Acantholimon glutaceum* (Jaub. et Sp.) Boiss., 1a) calyx. 2. *A. lepturoides* (Jaub. et Sp.) Boiss., 2a) calyx. 3. *A. Nikitini* (Lincz., 3a) calyx. 4. *A. quinquelobum* Bge., 4a) calyx. 5. *A. crinaceum* (Jaub. et Sp.) Lincz., 5a) calyx.

funnelform, the tube ca. 6-7 mm long, rather densely hairy between the nerves; calyx limb ca. 5 mm broad, white, often narrowly purple-tinged along the nerves, rather distinctly 10-lobed, the bare nerves reaching the margin or scarcely excurrent; petals bright pink. Fl. July-September.

Stony mountain slopes, at altitudes of about 2000-3000 m. — Soviet Central Asia: Mtn. Turkm. (Centr. Kopet Dagh). **Gen. distr.:** Iran. 356 (N. Khurasan). Described from the vicinity of Ashkhabad (Mt. Bozikhonov and other mountains) and from N. Khurasan. Type in Leningrad.

52. **A. alatavicum** Bge. in Mem. Acad. Sc. Petersb. VII ser. XVIII, 2 (1872) 40, p.p. excl. synonym. Rupr.; Fedch. O. and B. Perech. rast. Turk. 5, 190. — *A. alatavicum* var. *α. typicum* Rgl. in Tr. Bot. Sada, VI, 2 (1880) 390. — *A. Hohenackeri* var. *subsessilis* Trautv. in Bull. Soc. Nat. Mosc. XXXIX, 4 (1866) 460, non Boiss. — *A. alatavicum*, *β. subsessile* Herd. in Bull. Soc. Nat. Mosc. XLI, 2 (1868) 395, non Boiss. — *Statice Hohenackeri* Ldb. Fl. Ross. III (1847-1849) 469, p.p. quoad pl. Schrenk. non Jaub. et Sp.

Rather compactly pulvinate subhemispherical shrubs, up to 30-40 cm in diameter; summer leaves pale green or glaucescent, applanate-triquetrous, linear-subulate, rigid, (1) 1.5-2.5 (4) cm long and ca. 1-1.5 mm broad, acerose, glabrous, the margin (sometimes merely at base) minutely ciliate-scabrous; spring leaves slightly shorter and scarcely broader, otherwise alike; scapes slightly exceeding the leaves or scarcely so, 3-6 cm long, simple, rather densely puberulous; spikes ca. 2 cm long, densely 5-8-spiculed, distinctly 2-ranked; spicules ca. 11-14 mm long, all single-flowered; bracts glabrous; outer bract ca. 5-6 mm long $\frac{2}{3}$ or rarely half as long as the inner bracts, oblong-ovate, gradually acuminate, mucronulate or mucronate, rather narrowly scarious-margined; inner bracts about equaling or slightly exceeding the calyx tube, broadly scarious-margined, rather gradually acuminate or obtusely round-tipped and scarcely notched at apex, mucronate or mucicous; calyx ca. 10-13 mm long, funnelform, the tube ca. 6-8 mm long, sparsely or fairly densely hairy between the nerves (occasionally also on the nerves) in upper part or throughout; calyx limb 4-5 mm broad, white, rather distinctly 10-lobed, the nerves terminating slightly below or reaching the margin, rarely scarcely excurrent, bare or in lower part more or less densely covered with hairs; petals bright pink or pink. Fl. July-August.

Stony mountain slopes, at altitudes of about 2000-3000 m, often in steppe and wormwood-steppe associations. — Soviet Central Asia: Dzu.-Tarb. (Saur and Dzungarian Ala Tau ranges), T. Sh. (chiefly centr. and E. parts), Pam.-Al. (N. part). **Gen. distr.:** Dzu.-Kash. (E. Tien Shan and Dzungarian Ala Tau). Described from Dzungarian Ala Tau and the Lake Issyk-Kul' area. Type and paratype in Leningrad.

357 Note. Within the scope adopted here, *A. alatavicum* still represents a group of minor forms which can only be sorted out with the aid of more ample material and by means of field observations, especially in connection with the forms of the N. Pamir-Alai (Alai and Turkestan ranges. Zeravshan R. basin).

53. **A. tarbagataicum** Gamajun. in Bot. Mat. Gerb. Bot. Inst. AN SSSR, XIII (1950) 204 and in Vestn. Akad. nauk Kazakhsk. SSSR, 1 (1951) 77. Ic.: Gamajunova, l.c. (1951), Figure 1.

Rather compactly pulvinate low shrubs, up to 20 (?) cm in diameter; summer leaves rather bright green, applanate-triquetrous, linear-subulate, rather rigid, (2) 2.5-3 (4) cm long and ca. 0.5-1 mm broad, acerose, glabrous or sparsely and minutely puberulous, the margin minutely ciliate-scabrous; spring leaves markedly shorter and scarcely broader, otherwise alike; scapes greatly exceeding the leaves, 8-15 cm long, with a single short branch at the top or simple, very sparsely puberulous to glabrate, the rachis of spike more densely puberulous; spikes ca. 2 (3) cm long, loosely 5-8-spiculed, rather distinctly 2-ranked; spicules ca. 12 mm long, all single-flowered; bracts glabrous; outer bracts ca. 5 (6) mm long, about two-thirds as long as the inner bracts, ovate, rather gradually acuminate, mucronate, rather narrowly scarious-margined; inner bracts equaling or scarcely shorter than the calyx tube, broadly scarious-margined, obtusely acuminate or round-tipped, minutely mucronulate; calyx ca. 11 mm long, funnelform, the tube ca. 7 mm long, rather densely hairy between the nerves; calyx limb ca. 4 mm broad, white, rather distinctly 10-lobed, the bare nerves distinctly excurrent; petals dark purple (or "dark purplish-violet"?). Fl. June-July.

Stony mountain slopes, at altitudes of about 1800-2000 m, "in mixed xerophytic subalpine plant associations"—Soviet Central Asia: Dzu.-Tarb. (Tarbagatai Range). Endemic. Described from Sondyk-Tas Mts. Type in Alma Ata; isotype in Leningrad.

54. **A. Sackenii** Bge. in Mem. Acad. Sc. Petersb. VII ser. XVIII, 2 (1872) 68, in observ. ("Sackeni"); Fedch. O. and B. Perech. rast. Turk. 5, 189.—*A. Hohenackeri* γ. *virens* Rupr. in Mem. Acad. Sc. Petersb. VII ser. XIV, 4 (1869) 69.—? *A. desertorum* Rgl. in Tr. Bot. Sada, VI, 2 (1880) 391; Fedch. O. and B. l.c. 190.

358 Rather compactly pulvinate subhemispherical shrubs, 20-30 cm in diameter; summer leaves pale green, applanate-triquetrous, linear-subulate, rigid, (1.5) 2-3 (3.5) cm long and ca. 1-1.5 mm broad, acerose, glabrous, the margin minutely ciliate-scabrous to nearly smooth; spring leaves markedly shorter and scarcely broader, otherwise alike; scapes greatly exceeding the leaves, (5) 8-12 cm long, branched in upper part, rarely simple, rather densely pubescent; spikes ca. 2 (3) cm long, rather densely 5-10-spiculed, distinctly 2-ranked; spicules ca. 12-13 mm long, all single-flowered; bracts glabrous; outer bract ca. 6 mm long, two-thirds as long as the inner bracts, ovate, gradually acuminate, minutely mucronulate, rather narrowly scarious-margined; inner bract shorter than to scarcely exceeding the calyx tube, broadly scarious-margined, rather gradually acuminate or obtusely round-tipped, minutely mucronulate or muticous; calyx ca. 11-12 mm long, funnelform, the tube ca. 7 mm long, rather densely hairy between the nerves; calyx limb ca. 4 mm broad, white, rather distinctly 10-lobed, the nerves terminating just below the margin; petals pink or bright pink. Fl. June-July.

Stony mountain slopes, at altitudes of 1500-2500 (?) m.—Soviet Central Asia: T. Sh. (Central to S. part of the Naryn R. basin and Lake Issyk-Kul'). Pam.-Al. (Alai Range, west to the Isfairam R. basin?). Endemic. Described from the Dzhaman-Daban Pass area. Type in Leningrad.

Note. Closely akin to *A. Albertii* Rgl. and replacing it in Central Tien Shan. The identity of *A. Sackenii* Bge. with *A. desertorum* Rgl.

collected from the southern shore of Lake Issyk-Kul' is as yet not quite clear to me, due to the poor state of preservation of the authentic specimen of the latter species and the lack of new collections.

55. **A. pamiricum** Czerniak. sp. n. in Addenda XVII, 738.—

A. alatavicum O. et B. Fedtsch. Perech. rast. Turk. 5 (1913) 190, p.p. quoad. pl. pamir. non Bge.

Densely pulvinate subhemispherical shrubs, up to 20-40 cm (and more ?) in diameter; summer leaves applanate-triquetrous, narrowly linear-lanceolate or subulate, rigid, (1) 1.5-2 (3) cm long and ca. 1 mm broad, acerose, glabrous (or sometimes sparsely hairy above), the margin minutely ciliate-scabrous; spring leaves markedly shorter and broader (up to 1.5-2 mm broad), otherwise alike; scapes rather considerably exceeding the leaves, up to 6-12 cm long, simple or with 1 or 2 branches at the top, glabrous; spikes ca. 1.5-2 cm long, rather compactly 5-7-spiculed; spicules ca. 11-12 mm long, all single-flowered; bracts glabrous; outer bract ca. 2.5-4 mm long, about one-third to half as long as the inner bracts, broadly ovate, almost round-tipped or gradually acuminate, mucronulate, rather narrowly scarious-margined; inner bracts about equaling or slightly exceeding the calyx tube, broadly scarious-margined, obtusely pointed or round-tipped or sometimes scarcely notched, minutely mucronulate or muticous; calyx ca. 10-11 mm long, funnelform, the tube ca. 6 mm long, rather sparsely covered with short hairs between the nerves (usually only in upper part); calyx limb 4-5 mm broad, white, rather distinctly 10-lobed, the bare nerves reaching the margin; petals pink. Fl. July-August.

Stony mountain slopes, commonly in wormwood and grass associations, at altitudes of about 3000-4000 m.— Soviet Central Asia: Pam.-Al. (Pamir).

Gen. distr.: ? Iran. (E. Afghanistan). Described from S Pamir (Alichur R. basin). Type in Leningrad.

Note. A species of the *A. alatavicum* Bge. cycle; differing in the often branched and always quite glabrous scapes, shorter outer bracts, and the leaves that are sometimes sparsely hairy above (evidently a characteristic of only some of the Pamir species). From the apparently related *A. Munroanum* Aitsch. et Hemsl., described from the Safed Koh Range on the border of Afghanistan and Pakistan, it is distinguishable by the much longer scapes and leaves. Some of the relatively short-leaved specimens from Pamir were identified by E. G. Chernyakovskaya as *A. Munroanum*, but I am not convinced as to the correctness of this determination. Chernyakovskaya also distinguished (in the herbarium). *A. schugnanicum* Czerniak. (from the Vakhan and Ishkashim areas), but the characteristics distinguishing it from *A. pamiricum* (other than the somewhat broader leaves) are so far not quite clear to me. Thus, within the scope adopted here, *A. pamiricum* needs further study and it deserves close attention on the part of investigators of the Pamir vegetation in which acantholimonas often play the role of association indicators.

56. **A. kokandense** Bge. in Regel, Tr. Bot. Sada, III (1875) 99 and in Izv. Obshch. lyubit. estestvozn., antrop. i etnogr. XXXIV, 2 (1882) 72; Fedch. O. and B. Perech. rast. Turk. 5, 191.

Rather loosely cespitose subhemispherical shrubs, up to 20-40 cm (and more?) in diameter; summer leaves bright green, applanate-triangular, linear-subulate, rigid, (1) 1.5-2 (2.5) cm long and ca. 0.5 mm broad, aciculate, rather densely covered on all sides with short hairs, or rarely merely the margin ciliate; spring leaves markedly shorter and slightly broader (ca. 1 mm broad at base), glabrate, otherwise alike; scapes rather considerably exceeding the leaves, 4-8 cm long, simple, rather densely puberulous; spikes ca. 1.5-2 cm long, fairly compactly or loosely 4-7-spiculate; spicules ca. 11-13 mm long, all single-flowered; bracts glabrous or very rarely hairy; outer bract ca. 6-7 mm long, about two-thirds as long as the inner bracts, ovate, rather gradually acuminate, mucronate, rather broadly scarious-margined; inner bracts slightly 360 exceeding the calyx tube, broadly scarious-margined, obtusely pointed or round-tipped and sometimes scarcely notched, mucronate, or muticous; calyx ca. 10-12 mm long, funnelform, the tube ca. 6-7 mm long, sparsely covered with short hairs between the nerves in upper part; calyx limb 4-5 mm broad, white, sometimes purple-tinged along the nerves, rather distinctly 10-lobed, the bare nerves reaching the margin or scarcely excurrent; petals pink. Fl. July-August.

Stony mountain slopes, at altitudes of about 2000-3500 m. — Soviet Central Asia: Pam.-Al. (Alai Valley area). **Gen. distr.:** Dzu.-Kash. (SW part). Described from the Alai Range ("Descent down the Isfairam River in the Alai"). Type in Moscow; isotype in Leningrad.

57. **A. velutinum** Czerniak. sp. n. in Addenda XVII, 739. —

A. alatavicum var. β . *puberulum* Bge. ex Rgl. in Tr. Bot. Sada, VI, 2 (1880) 390, p.p. excl. syn. omn.

Rather loosely pulvinate subhemispherical shrubs, up to 20-40 cm (and more?) in diameter; summer leaves cinerous-green, applanate-triangular, linear-subulate, very rigid, 1.5-2.5 (4) cm long and ca. 1-1.5 mm broad, aciculate, rather densely puberulous, often subvelutinous; spring leaves slightly shorter and broader, glabrous or nearly so, otherwise alike; scapes scarcely or slightly exceeding the leaves, 3-5 cm long, simple, densely subvelutinous-pubescent; spikes ca. 2-2.5 cm long, rather compactly 5-7 (11)-spiculate; spicules ca. 11-13 mm long, all single-flowered; bracts rather densely pubescent or glabrous; outer bract ca. 5-6 mm long, about two-thirds as long as the inner bracts, oblong-ovate to ovate, rather gradually acuminate, mucronate, rather broadly scarious-margined; inner bracts markedly exceeding the calyx tube, broadly scarious-margined, obtusely pointed or round-tipped, mucronate or muticous; calyx ca. 10-12 mm long, funnelform, the tube ca. 6-7 mm long, covered with short hairs between the nerves (sometimes only in upper part); calyx limb ca. 4-5 mm broad, white, sometimes narrowly purple tinged along the nerves, rather distinctly 10-lobed, the bare nerves reaching the margin or scarcely excurrent; petals pink. Fl. July-August.

Stony mountain slopes, at altitudes of about 2500-3000 m. — Soviet Central Asia: Pam.-Al. (Zeravshan R. basin and W. Pamir). Endemic (?). Described from the Fandarya River basin (Makshevat and Dzhidzhikrut gorges). Type and paratype in Leningrad.

Note. A species of the *A. alatavicum* Bge. cycle, closely related 361 to *A. kokandense* Bge., from which it differs in the denser, often

subvelutinous vesture of leaves, scapes, and sometimes bracts, as well as the broader rigid leaves.

58. **A. Albertii** Rgl. in Tr. Bot. Sada, VI, 2 (1880) 389 ("Alberti").— Fedch. O. and B. Perech. rast. Turk. 5 (1913) 189.

Loosely pulvinate subhemispherical shrubs, up to 40-60 cm in diameter, often with long procumbent branches; summer leaves rather bright green, applanate-triquetrous or nearly flat, linear-subulate, rigid, (1) 2-3 (4) cm long and ca. 1-1.5 (2) mm broad, acerose, rather densely short-hairy to glabrate (f. *glabrum* Lincz.), the margin minutely ciliate-scabrous; spring leaves much shorter and slightly broader, glabrous, the margin ciliate-scabrous; scapes greatly exceeding the leaves, 8-15 cm long, with few short branches at the top, very rarely simple, rather densely puberulous; spikes up to 3-4 cm long, rather loosely 4-8-spiculed; spicules ca. 13-15 mm long, all single-flowered; bracts densely puberulous or glabrous (f. *glabrum*); outer bract ca. 5-7 mm long, about one-half to two-thirds as long as the inner bracts, ovate, gradually pointed at apex, terminating in a cusp to 1.5 mm long, the margin rather narrowly scarious-margined; inner bracts about equaling or scarcely exceeding the calyx tube, with a broad rufous-scarious margin, rather gradually pointed, the cusp ca. 1 mm long; calyx ca. 12-14 mm long, funnelform, the tube ca. 7-9 mm long, rather densely covered with short hairs between the nerves; calyx limb ca. 5-6 mm broad, white, rather distinctly 10-lobed, sometimes scarcely hairy between the nerves in lower part, the rather densely hairy or glabrous (f. *glabrum*) nerves reaching the margin or nearly so; petals bright pink. Fl. July-August (Plate XVII, Figures 5, 5a).

Stony mountain slopes, often in steppe and juniper-steppe associations, at altitudes of about 1000-2000 m.— Soviet Central Asia: Tien Shan (W. part: Angren and Chirchik river basins, Talass Ala Tau Range and adjoining part of Karatau Range, also N. slopes of the Kirghiz Ala Tau, east to Buamskii Gorge). Endemic. Described from the Chatkal R. valley. Type in Leningrad.

59. **A. karatavicum** Pavl. in Vestn. Akad. nauk Kazakhsk. SSR, 1 (1949) 35.

362 Rather compactly pulvinate subhemispherical shrubs, 10-15 (25) cm in diameter; summer leaves pale green or glaucescent-green, applanate-triquetrous, linear-subulate, rigid, 1-2 (2.5) cm long and ca. 0.3-0.5 mm broad, acerose, densely pubescent, sometimes subvelutinous; spring leaves markedly shorter and slightly broader, glabrous or nearly so, the margin minutely ciliate-scabrous; scapes slightly exceeding the leaves, 2-4 cm long, with very short branches at the top, densely subvelutinous-puberulent; spikes ca. 1-1.5 cm long, rather loosely 2-3-spiculed, or spicules solitary on the main axis; spicules ca. 10 mm long, all single-flowered; bracts densely pubescent; outer bract ca. 3-4 mm long, about half as long as the inner bracts, broadly ovate, abruptly attenuate toward apex, terminating in a cusp ca. 1-1.5 mm long, rather narrowly scarious-margined; inner bracts about two-thirds the length of the calyx tube, broadly scarious-margined, rather gradually acuminate or round-tipped to subtruncate and broadly emarginate, with a cusp up to 1-1.5 mm long; calyx ca. 9-10 mm long, funnelform, the tube ca. 6 mm long, densely hairy on the nerves and in upper part also on the nerves; calyx limb

ca. 4 mm broad, white, obscurely 10-lobed, sparsely hairy between the nerves in lower part, the densely hairy nerves reaching the margin or nearly so; petals pink. Fl. July-August.

Stony mountain slopes, at altitudes of about 600-1500 (?) m. — Soviet Central Asia: Tien Shan (Karatau Range: Ul'kun-Aktau Range, near Berkuty Gorge and the Kainar-Bastau natural boundary, north of Lake Biikikol'). Endemic. Described from the Ul'kun-Aktau Range. Type in Alma Ata.

60. **A. Titovii** Lincz. sp. n. in Addenda XVII, 740.

363 Compactly pulvinate subdepressed to subhemispherical shrubs, 20-30 cm in diameter; summer leaves glaucescent-green, applanate-triquetrous, linear-subulate or acicular, rigid, (0.5) 1-1.5 (2) cm long and ca. 0.5-1 mm broad, acerose, rather densely puberulous or glabrous, the margin (sometimes only in lower part) minutely ciliate-scabrous; spring leaves slightly shorter and scarcely broader, otherwise alike; scapes greatly (rarely slightly) exceeding the leaves, (2) 4-7 cm long, simple or rarely scarcely branched, densely puberulous; spikes ca. 2-2.5 cm long, loosely 4-6-spiculed, rather distinctly 2-ranked; spicules 10-12 mm long, all single-flowered; bracts glabrous or scarcely puberulous; outer bract ca. 6-7 mm long, about two-thirds as long as the inner bracts, oblong-ovate, gradually acuminate, short-cuspidate, rather narrowly scarious-margined; inner bracts slightly exceeding or about equaling the calyx tube, broadly scarious-margined, rather obtusely pointed or round-tipped, terminating in a cusp ca. 1-1.5 mm long; calyx ca. 11-12 mm long, funnelform, the tube ca. 7 mm long, rather sparsely hairy between the nerves; calyx limb ca. 4 mm broad, white, rather distinctly 10-lobed, the bare nerves reaching the margin or very nearly so; petals pink or bright pink. Fl. June-July.

Stony mountain slopes, at altitudes of about 1500 m. — Soviet Central Asia: Tien Shan (Chu-Ili Mts). Endemic. Described from the Kendyk-Tas natural boundary. Type in Leningrad.

Note. Apparently a restrictedly local species, related to *A. alatavicum* Bge. Readily distinguishable by the more compact cushions, shorter narrow leaves, longer and sometimes branched scapes, and the markedly longer cusp (up to 1-1.5 mm) of the inner bracts.

61. **A. Korolkovii** (Rgl.) Korov. comb. n. — *A. alatavicum* var. γ . Korolkowi Rgl. in Tr. Bot. Sada, VI, 2 (1880) 390.

Compactly pulvinate subdepressed to subhemispherical shrubs, up to 20-40 (and more?) cm in diameter; summer leaves green, applanate-triquetrous, narrowly linear-lanceolate or subulate, rigid, 0.6-1.2 (1.5) cm long and ca. 1 mm broad, acerose, rather densely puberulous on all sides; spring leaves slightly shorter, glabrate, otherwise alike; scapes scarcely or slightly exceeding the leaves, 2-4 (6) cm long, simple, densely pubescent throughout; spikes ca. 1.5-2 cm long, fairly compactly or rather loosely 4-7 (9)-spiculed; spicules ca. 10-13 mm long, all single-flowered; bracts pubescent or glabrous; outer bract ca. 3-4 (5) mm long, commonly about half as long as the inner bracts, broadly ovate, almost round-tipped or rather gradually pointed, cuspidate, rather narrowly scarious-margined; inner bracts about equaling or slightly shorter than the calyx tube, broadly scarious-margined, obtusely pointed or round-tipped and sometimes scarcely-notched, mucronate or submuticous; calyx ca. 9-12 mm long,

funneliform, the tube ca. 5-7 mm long, rather sparsely covered between the nerves (sometimes only in upper part) with short hairs; calyx limb ca. 4-5 mm broad, white, sometimes narrowly purple-tinged along the nerves, rather distinctly 10-lobed, the nerves hairy in lower part or bare, reaching the margin or very nearly so or scarcely excurrent in the small notches of the lobes; petals pink. Fl. July-August.

Stony mountain slopes and rocks, at altitudes of about 2000-3000 (4000) m. Soviet Central Asia: Pam.-Al. (S. Pamir), T. Sh. (W. part). Endemic(?). Described from Chirchik R. basin in W. Tien Shan. Type in Leningrad.

364 **Note.** A relatively rare exception is represented in W. Tien Shan by completely glabrous specimens, recorded by E. G. Chernyakovskaya as *A. Korolkovii* var. *glabrum* Czerniak. The S. Pamir form is not quite typical and it may prove necessary in the future to separate it from the W. Tien Shan form.

62. A. Knorringianum Lincz. sp. n. in Addenda. XVII, 740.

Compactly pulvinate subhemispherical shrubs, up to 20-40 (?) cm in diameter; summer leaves green, applanate-triangular, narrowly linear-lanceolate, rigid, 0.8-1 (1.5) cm long and ca. 1 mm broad, acrose, glabrous, the margin minutely ciliate-scabrous; spring leaves slightly shorter, otherwise alike; scapes scarcely exceeding the leaves, simple; spikes subsessile, ca. 1.5-2.5 cm long, loosely 2-5-spiculed; spicules ca. 15-18 mm long, all single-flowered; bracts glabrous; outer bract ca. 7-8 mm long, about or just above one-third as long as the inner bracts, ovate-lanceolate, gradually acuminate, terminating in a fairly long cusp, rather broadly scarious-margined; inner bracts slightly exceeding or about equaling the calyx tube, very broadly scarious-margined, terminating in a fairly long cusp; calyx ca. 14-17 mm long, funneliform, the tube ca. 8-9 mm long, sparsely or very sparsely pilose between the nerves, to glabrate; calyx limb ca. 6-8 mm broad, white, obscurely 10-lobed, the bare purple nerves reaching the margin or scarcely excurrent in the small notches of the lobes; petals pink or bright pink (?). Fl. July-August (?).

Stony mountain slopes and rocks on the border of the subalpine and tree-and-scrub zones. — Soviet Central Asia: T. Sh. (W. part, W. slope of the Fergana Range). Endemic. Described from Mt. Baubashata. Type in Leningrad.

Note. Evidently a species affiliated to *A. Korolkovii* (Rgl.) Korov. of W. Tien Shan, from which it differs conspicuously in the much broader calyx limb and some other characteristics.

63. A. parviflorum Rgl. in Izv. Obshch. lyubit. estestvozn., antrop. i etnogr. XXXIV, 2 (1882) 73; Fedch. O. and B. Perech. rast. Turk. 5, 191.

Fairly compactly or rather loosely pulvinate subhemispherical shrubs, up to 20-40 (?) cm in diameter; summer leaves pale green, applanate-triangular, linear-subulate, rigid, 2-3.5 (4.5) cm long and ca. 1-1.5 mm broad, acrose, glabrous or variously pubescent, sometimes subvelutinous, the margin minutely ciliate-scabrous or sometimes smooth; spring leaves markedly shorter and slightly broader, otherwise alike; scapes greatly exceeding the leaves, 15-25 (40) cm long, with few (2 or 3?) rather short branches above the middle, the scape and rachis of spikes puberulous to glabrous; spikes ca. 1.5-2 cm long, rather compactly 5-7 (10)-spiculed,

365

distinctly 2-ranked; spicules ca. 8-11 mm long, all single-flowered; bracts glabrous, rarely scarcely pubescent; outer bract ca. 3-5 mm long, about one-half to two-thirds as long as the inner bracts, ovate, gradually acuminate, minutely mucronulate, rather broadly scarious-margined; inner bracts markedly exceeding or about equaling the calyx tube, broadly or very broadly scarious-margined, obtusely round-tipped, mucronulate or muticous; calyx ca. 7-8 (10) mm long funnelform, the tube ca. 4-6 mm long, sparsely pilose between the nerves (often merely in upper part); calyx limb ca. 3-4 mm broad, white or sometimes narrowly purple-tinged along the nerves, obscurely 10-lobed, the bare nerves reaching or rarely not quite reaching the margin or scarcely excurrent; petals pink. Fl. June-July.

Stony mountain slopes, at altitudes of about 2000-3000 (?) m. — Soviet Central Asia: Pam.-Al. (Zeravshan R. basin and W. Pamir). Endemic? Described from the Zeravshan River basin (Saratag Gorge). Type in Moscow; isotype in Leningrad.

Note. This species is presented here with a rather wide compass, without adopting vesture as a distinguishing characteristic, because of the lack of adequate indication as to its geographical significance. In respect of other characteristics these forms are very similar, as far as can be ascertained, from the as yet limited material, especially so from Zeravshan.

64. **A. Komarovii** Czerniak. sp. n. in Addenda XVII, 741.

Compactly pulvinate subhemispherical shrubs, 10-20 cm in diameter; leaves glaucous to glaucous-green, bluntly applanate-triquetrous or nearly flat, narrowly linear-lanceolate to linear, rigid, (0.3) 0.5-1 (1.5) cm long and ca. 0.5-1 mm broad, gradually narrowed toward apex, acuminate-mucronate, glabrous, the margin minutely ciliate-scarious; scapes markedly exceeding the leaves, up to 2 cm long, simple, densely puberulous; spikes terminal, ca. 1 cm long, densely 3-7-spiculed, rather distinctly 2-ranked; spicules ca. 9-10 mm long, single-flowered; bracts glabrous or sparsely puberulous; outer bract ca. 3-4 mm long, about two-thirds as long as the inner bracts, ovate to oblong-ovate, rather gradually pointed, mucronate, the margin rather narrowly scarious; inner bracts greatly exceeding the calyx tube, very broadly scarious-margined or scarious throughout except for the narrow midrib, obtusely round-tipped, minutely mucronulate or muticous; calyx ca. 7-9 mm long, funnelform, the tube ca. 4-5 mm long, rather sparsely pilosulous between the nerves to glabrate; calyx limb ca. 4 mm broad, white, obscurely 10-lobed or subtruncate, the bare purple nerves terminating just below the margin; petals pink. Fl. July.

Stony fine-earth slopes, at altitudes of 2500-3000 m. — Soviet Central Asia: Pam.-Al. (Zeravshan R. basin). Endemic. Described from the Yagnob River valley. Type in Leningrad.

Note. Closely akin to *A. parviflorum* Rgl., representing in relation to that species a vicarious form of higher elevation and differing in the more compact cushions, much shorter leaves, and the very poorly developed scapes.

Section 5. **TRAGACANTHINA** Bge. in Mem. Acad. Sc. Petersb. VII ser. XVIII, 2 (1872) 54; Boiss. Fl. or. IV (1879) 847. — Spicules single-flowered (in some Iranian species 2- or 3-flowered); spikes short and rather

compact or fairly loose; scapes simple or more or less branched; outer bracts usually narrowly scarious-margined; calyx funnelform or subtubular, straight at base, the nerves of the limb narrow and bare within; spring and summer leaves conspicuously different; summer leaves usually quite smooth on the margin, applanate-terete (nearly subulate or acicular), very rigid and strongly prickly; spring leaves mostly scarious-margined, much shorter, broad and flat, less rigid and less prickly, fairly fleshy, early marcescent, and readily deciduous.

Subsection 1. *STENOSTOMA* Bge. in Mem. Acad. Sc. Petersb. VII ser. XVIII, 2 (1872) 55; Boiss. Fl. or. IV (1879) 825 ("Stenostomata"). — Calyx subtubular, with a very narrow limb.

65. **A. Karelinii** (Stschegl.) Bge. in Mem. Acad. Sc. Petersb. VII ser. XVIII, 2 (1872) 58; Boiss. Fl. or. IV, 847; Kuzn. in Mat. Fl. Kavk. IV, 1, 197; Grossg. Fl. Kavk. ed. 1, III, 216 and Opred. rast. Kavk. 592. — A. Szovitsii Boiss. et Buhse in Nouv. Mem. Soc. Nat. Mosc. XII (1860) 184. — *Statice Karelinii* Stschegl. in Bull. Soc. Nat. Mosc. XXIV, 4 (1851) 475. — Ic.: Stschegl. l.c. tab. XIII, f. 4, 4a.

Loosely pulvinate subhemispherical shrubs, up to 30-40 cm in diameter; summer leaves glaucous-green, applanate-terete (nearly subulate), very rigid, 2-4 (6) cm long and ca. 1 mm in diameter, acerose, glabrous, smooth-margined; spring leaves much shorter (about one-fifth to one-third as long) and markedly broader, applanate-triquetrous, apiculate-mucronate, 367 glabrous, minutely ciliate-scabrous on the margin, fairly fleshy, early marcescent and readily deciduous; scapes rather considerably exceeding the leaves, up to 15-30 cm long, long-branched in upper part and sometimes with branches of second order, glabrous or at base sometimes puberulous; scapes 3-10 cm long, loosely (5) 8-15-spiculed (the joints ca. 4-8 mm long), distinctly 2-ranked, strongly flexuous; spicules ca. 10-12 mm long, all single-flowered; bracts glabrous; outer bract 5 mm long, markedly shorter than the inner bracts (down to two-thirds their length), oblong-ovate, gradually acuminate, mucronate, rather narrowly scarious-margined; inner bracts one-half to two-thirds as long as the calyx, broadly scarious-margined, gradually acuminate or obtusish, mucronate or muticous; calyx ca. 9-11 mm long, subtubular, the tube ca. 7-8 mm long, more or less pilose between the nerves in upper part or glabrate; calyx limb ca. 2-3 mm broad, white, shortly and subacutely 5-lobed or more or less distinctly 10-lobed, the nerves bare or at base hairy, reaching the margin or very nearly so or excurrent through the primary lobes; petals bright pink. Fl. May-June.

Fine-earth and stony slopes of low mountains, at altitudes of 600-900 m. — Caucasus: E. Transc. (SW part — along the Araks R.), S. Transc. (S. part). **Gen. distr.:** Arm.-Kurd. ?, Iran. (SW part). Described from the vicinity of Nakhichevan. Type in Leningrad.

66. **A. quinquelobum** Bge. in Mem. Acad. Sc. Petersb. VII ser. XVIII, 2 (1872) 56; Boiss. Fl. or. IV, 848; Kuzn. in Mat. Fl. Kavk. IV, 1, 197; Grossg. Fl. Kavk. ed. 1, III, 216 and Opred. rast. Kavk. 592. — Exs.: Herb. Fl. Cauc. No. 232.

Loosely pulvinate subhemispherical shrubs, up to 30-40 cm in diameter; summer leaves glaucous-green, applanate-terete (nearly subulate), very rigid, 2-4 (7) cm long and ca. 1 mm in diameter, acerose, glabrous, smooth-margined; spring leaves one-fifth to one-third as long, markedly broader, applanate-triquetrous, apiculate-mucronate, glabrous, minutely ciliate-scabrous on the margin, fairly fleshy, early marcescent and readily deciduous; scapes greatly exceeding the leaves, up to 15-30 cm long, rather long-branched in upper part, sometimes with branches of second order, glabrous or at base pubescent; spikes 3-6 (10) cm long, loosely 5-10 (15)-spiculed (the joints ca. 4-8 mm long), distinctly 2-ranked, strongly flexuose spicules ca. 9-10 mm long, all single-flowered; bracts glabrous; outer bract ca. 3-5 mm long, about two-thirds as long as the inner bracts, ovate to oblong-ovate, gradually acuminate, minutely mucronulate or submuticous, rather narrowly scarious-margined; inner bracts about one-half to two-thirds (two-fifths) the length of calyx, broadly scarious-margined, rather gradually acuminate or obtusish, minutely mucronulate or muticous; calyx ca. 8-9 mm long, subtubular, the tube ca. 6-7 mm long, glabrous; calyx limb ca. 1.5-2 mm broad, white, shortly and obtusely 5-lobed, sometimes subtruncate, the bare nerves reaching the margin between the lobes (and not through them); petals bright pink. Fl. May-June (Plate XVIII, Figures 4, 4a).

368 Fine-earth and stony slopes of low mountains.—Caucasus: S. Transc. (S. part). **Gen. distr.:** Arm.-Kurd., Iran. (NW part). Described from Khurasan (in the vicinity of Shakhrud). Type in Leningrad.

Note. Closely related to the preceding species and apparently also to the Iranian *A. truncatum* Bge.

67. *A. Nikitinii* Lincz. sp. n. in Addenda XVII, 742.—*A. longiflorum* Lincz. in Rast. res. Turkm. (1935) 237, 283, non Boiss.

Rather loosely pulvinate subhemispherical shrubs, up to 30-40 cm in diameter, very rigid, 1.5-3 cm long and ca. 1 mm in diameter, acerose, glabrous, the margin rather regularly ciliate-scabrous; spring leaves a quarter to half as long and markedly broader, applanate-triquetrous, apiculate-mucronate, glabrous, minutely ciliate-scabrous on the margin, fairly fleshy, early marcescent and readily deciduous; scapes rather considerably exceeding the leaves, ca. 5-7 cm long, with 2 or 3 short, branches at the top, glabrous; spikes ca. 2 cm long, loosely 2-5-spiculed (the joints ca. 2-3 mm long), distinctly 2-ranked; spicules ca. 15-16 mm long, all single-flowered; bracts glabrous; outer bract ca. 5 mm long, about half as long as the inner bracts, oblong-ovate, gradually acuminate, mucronate, narrowly scarious-margined; inner bracts about two-thirds the length of calyx, broadly scarious-margined, rather gradually acuminate, terminating in a cusp up to 1.5-2 mm long; calyx ca. 14-15 mm long, subtubular, the tube ca. 12-13 mm long, glabrous, scarcely enlarged at the top; calyx limb ca. 2 mm broad, white, deeply parted (the entire breadth) into 5 acutely triangular lobes, the bare nerves rather distinctly excurrent; petals pink. Fl. May-June (Plate XVIII, Figures 3, 3a).

369 Stony mountain slopes, at altitudes of about 1200 m.—Soviet Central Asia: Mtn. Turkm. (Badkhyz — Gyaz-Gyaduk Range). **Gen. distr.:** ? Iran. (E. Khurasan and NW Afghanistan). Described from Rakhnatur Pass area. Type and paratype in Leningrad.

Note. A species affiliated to *A. longiflorum* Boiss., from which it differs in the ciliate-scabrous (not smooth) summer leaves, longer scapes, the longer cuspidate inner bracts, and the shorter calyx.

Subsection 2. *EURYSTOMA* Bge. em. Boiss. Fl. or. IV (1879) 825 ("Eurystomata"). — Subsect. *Eurystoma* Bge. in Mem. Acad. Sc. Petersb. VII ser. XVIII, 2 (1872) 58 et subsect. *Erythrostoma* Bge. l.c. 66. — Calyx funnellform, with a broad limb.

68. *A. balchanicum* Korov. in Tr. Turk. nauchn. obshch. I (1923) 79; Chernyak. in Tr. Bot. Sada, XLIV, 99.

Rather loosely pulvinate subhemispherical shrubs, 10-30 cm in diameter; summer leaves glaucous-green or glaucous, applanate-terete (nearly subulate), very rigid, 1.5-3 (4.5) cm long and ca. 1 mm in diameter, acerose, glabrous, the entire margin smooth; spring leaves one-fifth to one-half as long, applanate-triquetrous, apiculate-mucronate, glabrous, minutely ciliate-scabrous on the margin, fairly fleshy, early marcescent and readily deciduous; scapes scarcely or slightly exceeding the leaves, 3-5 (7) cm long, usually with 1 or 2 short branches at the top, glabrous; spikes 2-2.5 cm long, loosely 5-10-spiculed (the joints ca. 2-3 mm), distinctly 2-ranked; spicules ca 12-15 mm long, all single-flowered; bracts glabrous; outer bract ca. 3.5-4 mm long, about half as long as the inner bracts, oblong-ovate; gradually pointed at apex, minutely mucronulate or muticous, narrowly scarious-margined; inner bracts slightly shorter than; to about equaling the calyx tube, broadly scarious-margined, rather gradually pointed at apex, minutely mucronulate or muticous; calyx ca. (11) 12-14 (16?) mm long, funnellform, the tube ca. (6) 7-8 mm long, rather densely pilose on the nerves in the upper one-third; calyx limb ca. 5-6 mm broad, white, 5-lobed or obscurely 10-lobed, the nerves hairy in lower part, reaching the margin or scarcely excurrent; petals bright pink. Fl. May.

Stony mountain slopes, at altitudes of about (300) 500-1000 m. — Soviet Central Asia: Mtn. Turkm. (Greater and Lesser Balkhan ranges). Endemic. Described from the vicinity of the village of Dzhebel. Type in Tashkent; isotype and paratype in Leningrad.

Note. A species belonging to the critical, largely central and southern Iran cycle *A. tragacanthinum* (Jaub. et Sp.) Boiss. — *A. scoparius* (Jaub. et Sp.) Boiss. It is apparently more closely related to the Iranian *A. incomptum* Boiss. et Buhse, described from the Kerman-Yezd area, than to the Baluchistani *A. Stocksii* Boiss. with which it was compared 370 in the description. Another species of this group — *A. scorpius* (Jaub. et Sp.) Boiss. — was recently reported by A. A. Grossheim (Opred. rast. Kavk. (1949) 592) for S. Transcaucasia (Ordubad area), but I am not sure that this report does not refer to *A. tragacanthinum* (Jaub. et Sp.) Boiss. described from Lake Rizaiyeh (Urmia), or else to a distinct species.

69. *A. erinaceum* (Jaub. et Sp.) Lincz. comb. n. — *A. roseum* Boiss. Diagn. ser. 1, VII (1846) 71 et in DC. Prodr. XII (1848) 624 (incl. α . *pungens* et β . *erinacea* Boiss.) et Fl. or. IV (1879) 853; Bge. in Mem. Acad. Sc. Petersb. VII ser. XVIII, 2, 66; Chernyak. in Tr. Bot. Sada, XLIV (1931) 100 (incl. var. *pubescens* Czerniak). — *A. rubellum* Boiss. ex Bge. l.c. 66, pro syn. — *Statice erinacea* Jaub. et Sp. Ill.

pl. or. I (1842-1843) 163 et in Ann. sc. nat. 2 ser. XX (1843) 255. — *S. pungens* Jaub. et Sp. l.c. (1842-1843) 163 et l.c. (1843) 255, non Brot. 1804. — *S. Jauberti* Girard in Ann. sc. nat. 3 ser. II (1844) 331. — ? *S. juniperina* Willd. ex Schult. Syst. veg. VI (1820) 799.

Compactly pulvinate erinaceous subhemispherical shrub, 25-50 (and more) cm in diameter; summer leaves pale green or cineraceous-green, applanate-terete (nearly subulate), very rigid, 1-1.5 (2) cm long and ca. 0.5-1 mm in diameter, acerose, glabrous or pubescent to subvelutinous, the margin smooth or at the broad scarious base ciliolate; spring leaves a quarter to one-half as long, applanate-triquetrous, subacute, glabrous or pubescent, minutely ciliate-scarious at the margin, fairly fleshy, early marcescent and readily deciduous; spikes ca. 1-1.5 cm long, rather compactly 2-5-spiculed, sessile or nearly so; spicules ca. 10-12 mm long, all single-flowered; bracts glabrous or more or less densely hairy; outer bract 6-7 mm long, markedly shorter than the inner bracts (usually about two-thirds as long), oblong-ovate to sub lanceolate, terminating in a stout cusp up to 2-3 mm long, the margin rather narrowly scarious (conspicuously broader and sometimes shouldered at apex); inner bracts markedly exceeding the calyx tube, often reaching the middle of the limb, very broadly scarious-margined to nearly scarious, obtusely pointed at apex, slenderly mucronate; calyx ca. 9-10 mm long, funnelform, the tube ca. 6-7 mm long, sparsely pilose in upper part between the nerves; calyx limb ca. 3 mm broad, pink or purple, obscurely 10-lobed or subtruncate, the bare or hairy nerves reaching the margin or very nearly so; petals bright pink. Fl. July-August (Plate XVIII, Figures 5, 5a).

Stony mountain slopes, at altitudes of about 2000-2500 m. — Soviet Central Asia: Mtn. Turkm. (Kopet Dagh from Gaudan to Arvaz). **Gen. distr.:** Iran. (Iran and Afghanistan). Described from Iran. Type in Paris.

- 371 Note. Judging by the short description of *Statice juniperina* Willd. ex Schult. (l.c.), that begins with the words "leaves lanceolate", it may be supposed that Willdenow was not concerned with our species. This cannot, however, be fully ascertained without a study of the type sample of *S. juniperina* in Willdenow's herbarium.

Section 6. **GONTSCHAROVIA*** Lincz. sect. n. in Addenda XVII, 744. — Spicules 2-5-flowered; spikes short and fairly dense or long and loose, borne on simple few-branched scapes; outer bracts very small, rather narrowly scarious-margined; calyx subtubular (narrowly obconical), strongly oblique at base, the nerves of the limb narrow and bare within; leaf margin scarious in lower part, smooth farther up; spring and summer leaves similar, flat and rather broad.

70. **A. mirandum** Lincz. sp. n. in Addenda XVII, 742.

Compactly depressed-pulvinate shrubs, 10-15 cm in diameter; leaves glaucous, flat, narrowly linear-lanceolate to linear, rather rigid, (1) 1.5-2.5 (3) cm long and ca. 1.5-2 mm broad, minutely mucronulate glabrous, the margin at base minutely ciliate-scarious; scapes greatly exceeding the leaves, up to 25-50 cm long, very slender (only about 0.5 mm

* Named after N.F. Goncharov (1900-1942), investigator of the flora and vegetation of Soviet Central Asia and author of numerous botanical publications.

in diameter at base), simple, suberect, glabrous, smooth; flowers borne on the upper one-third or one-quarter of the scape; spike (5) 10-20 cm long, loosely 5-13-spiculed (the joints 2-3 times the length of spicules); spicules ca. 6-7 mm long, (2) 3-5-flowered, the flowers borne on pedicels ca. 2 mm long; bracts glabrous; outer bract ca. 1.5 mm long, much shorter than the first inner bract, broadly triangular-ovate, gradually acuminate at apex, rather narrowly scarious-margined; first inner bract ca. 3.5-4 mm long and 2 mm broad, strongly involute and partly enclosing the flowers, irregularly and broadly obovate, rather gradually pointed at apex, rather broadly scarious-margined (more broadly at apex); other inner bracts much smaller, scarious, with a narrow midrib; calyx ca. 5 mm long and 1 mm across at the middle, narrowly obconical, slightly enlarged at the top, more strongly so in fruit, the nerves of the tube densely covered throughout with long hairs; calyx limb 10-lobed, white, the narrowly triangular primary lobes much longer (ca. 1 mm long), with rather distinctly excurrent nerves, the short secondary lobes nerveless; petals pink pale (?). Fl. July-August (?) (Plate XIX, Figures 1, 1a).

- 372 Mountain slopes. — Soviet Central Asia: Pam.-Al. (Gissar Range? Tupalang R. basin). Endemic. Described from the area indicated. Type in Leningrad.

71. **A. mirum** Lincz. sp. n. in Addenda XVII, 743.

Compactly pulvinate depressed shrubs, ca. 10 cm in diameter; leaves glaucous or greenish-glaucous, flat, narrowly linear-lanceolate to linear, fairly rigid, 1-1.5 (2) cm long and ca. 1-1.5 (2) mm broad, minutely mucronulate, glabrous, the margin in lower part minutely ciliate-scarious; scapes greatly exceeding the leaves, up to 15-20 cm long, very slender (only about 0.5 mm in diameter at base), simple short-panicled in upper part or rarely simple, suberect, glabrous, smooth; spikes terminal, 1.5-2.5 cm long, rather densely 4-13-spiculed; spicules ca. 5-6 mm long, 2-4-flowered, the flowers borne on pedicels ca. 2 mm long; bracts glabrous; outer bract ca. 2 mm long, much shorter than the first inner bract, broadly triangular-ovate, gradually acuminate, narrowly scarious-margined; first inner bract ca. 4-5 mm long and 2.5-3 mm broad, strongly involute and partly enclosing the flowers, broadly rounded-ovate, rather gradually acuminate, rather narrowly scarious-margined (more broadly so at apex); other inner bracts markedly smaller, scarious, with a narrow midrib; calyx ca. 5 mm long and 1 mm across at the middle, narrowly obconical, slightly enlarged at the top, more strongly so in fruit, the nerves of the tube sparsely covered in lower part with long hairs; calyx limb 10-lobed, white, the rounded-triangular primary lobes ca. 1 mm long, with nerves reaching the margin or very nearly so, the rounded secondary lobes much shorter and nerveless; petals pale pink (?). Fl. July-August (?).

Mountain slopes. — Soviet Central Asia: Pam.-Al. (Gissar Range, Kanyaz R. basin? Tupalang R. basin). Endemic. Described from the area indicated. Type in Leningrad.

Lincz. in Tr. Tadzh. bazy AN SSSR, VIII (1940) 586; Bge. in Mem. Acad. Sc. Petersb. VII ser. XVIII, 2 (1872) 68, pro sect. gen. *Acantholimoni* Boiss.

373 Calyx tubular (with a nearly erect limb), scarious, the 5 herbaceous nerves bare on the inside, the 10 narrow lobes conspicuously unequal in alternation, the base straight; corolla large, subrotate; petals nearly distinct, except at base where united in a ring, long-clawed, reflexed at the tips, in lower part forming a tube by overlapping of margins, involute when fading; filaments of stamens distinct except at base where adnate to petals, slightly dilated in lower part, bare; styles distinct from base, bare; stigmas obliquely oblong-capitate to subcylindrical-capitate; ovary narrowly linear-cylindrical, strongly narrowed at the top and very gradually and imperceptibly passing into the style; fruit oblong-linear, not enlarged at the top, dehiscing with a small round lid and with valves. Perennial plants with rather soft deciduous dimorphous rosulate leaves (spring and summer leaves differing more or less in shape) and large bright or pale pink sessile flowers in 1- or 2-flowered spicules forming loose spikes borne on rather long simple spikes.

The genus is known to contain three species distributed through Soviet Central Asia, in the lower mountains of SW Pamir-Alai, and W. Tien Shan.

1. Calyx greatly exceeding the bracts; second inner bract large, herbaceous, green, involute, obliquely truncate, with a rather broad limb, tightly enclosing the calyx and together with it strongly divergent from the rachis 2.
- + Calyx scarcely exceeding the bracts; outer bract slightly appressed to rachis and enclosing the inner bracts and nearly the entire calyx 1. **Ch. sogdianum** Lincz.
2. Limb of second inner bract not more than 2-4 mm broad; calyx 1-1.5 mm in diameter, slightly enlarged in upper part, with narrow herbaceous nerves 2. **Ch. setiferum** (Bge.) Lincz.
- + Limb of second inner bract broad, angularly rounded, ovate or subcordate, 5-9 mm broad; calyx 2-2.5 mm in diameter, slightly inflated around the middle, with broad herbaceous nerves 3. **Ch. limbatum** Lincz.

1. **Ch. sogdianum** Lincz. in Tr. Tadzh. bazy AN SSSR, VIII (1940) 587.—Ic.: Lincz. l.c., Fig. 1.

374 Perennial, 20-90 cm tall; root fairly stout; caudex subspherical, usually 3-6-parted, densely clothed in remnants of old leaves; leaves all subradical, glaucous-green, densely covered with calcareous dots, dimorphous: spring leaves (on the outside) fairly soft and thin, early marcescent, narrowly oblanceolate to sublinear, 8-12 cm long and 2-4 mm broad, markedly enlarged toward apex and apiculate with a short slender bristle, the margin sparsely short-papillose; summer leaves rather rigidly fleshy, linear, triquetrous-carinate, 2.5-3.5 cm long and 1-2 mm broad, terminating in a short soft bristle, the margin densely short-papillose; scapes 5-20, erect, simple, straight below, in upper part angularly flexuous, brittle, with

* From the greek words *chaeta* = bristle, and *leimon* = meadow, meadow plant.

rather large oblong finely pointed scarious or scarious-herbaceous scales at the base of nodes, glabrous, densely calcareo-punctate, scabrous; flowers borne on the upper 3/4 or 4/5 of the scape in a narrow loosely 10-30-spiculed spike; spicules single-flowered, rarely 2-flowered; bracts 3 in single-flowered spicules; outer bract 10-13 (15) mm long and 3.5-4.5 mm broad, rigidly herbaceous, green, narrowly scarious-margined, linear-lanceolate to sublinear, long-acuminate, tightly appressed to rachis and enclosing nearly the entire calyx; inner bracts 2, covered by the outer bract, narrowly linear, 8-12 mm long and ca. 1.5 mm broad, scarious, with a narrow herbaceous midrib, finely pointed at apex, sometimes partially connate; calyx 11-14 (16) mm long and ca. 1.5 mm in diameter, tubular (with a nearly erect limb), the limb faintly ribbed, scarious, glabrous, with narrow herbaceous nerves; calyx limb deeply parted (to 2-3 mm) into 5 long narrowly linear long-acuminate principal lobes, with nerves nearly reaching the margin, and 5 much shorter intermediate nerveless lobes; petals bright pink. Fl. May-July; fr. June-August.

Fine-earth and slightly gravelly soils and clay outcrops in low mountains and foothills, at altitudes of 850-1400 m, usually in wormwood-ephemeroid associations and sometimes in pistachio woods.— Soviet Central Asia: Pam.-Al. (S. Tadzhikistan: Sangtoda, Kulyab, Muminabad; Chaltau, Karatau and Tereklitau ranges). **Gen. distr.:** ? N. Afghanistan. Described from S. Tadzhikistan. Type in Leningrad.

2. **Ch. setiferum** (Bge.) Lincz. in Tr. Tadzh. bazy AN SSSR, VIII (1940) 591, descr. emend.— *Acantholimon setiferum* Bge. in Mem. Acad. Sc. Petersb. VII ser., XVIII, 2 (1872) 68.— *Cephalorhizum setiferum* M. Pop. et Korov. in Tr. Turk. nauchn. obshch. I (1923) 39.— Ic.: Lincz. l.c. Fig. 2.

375 Perennial, 20-35 cm tall; roots fairly stout; caudex subspherical, usually 2-6 (10)-parted, short-branched, the branches stout with a thick coat of leaf remnants; leaves all subradical, greenish-glaucous or glaucous, densely calcareo-punctate, dimorphous: spring leaves (on the outside) soft, thin, promptly marcescent, narrowly oblanceolate to sublinear, 5-7 cm long and 1.5-2 mm broad, markedly enlarged and pointed, with a soft slender bristle 1-2 mm long, the margin sparsely short-papillose; summer leaves fleshy, 1-2 cm long, linear in lower part, enlarged and rounded-hastate further up to 3-5 mm broad, apically pointed or rounded, the soft slender bristle up to 3-3.5 mm long, the margin densely short-papillose; scapes commonly 6-12, erect, simple, nearly straight, jointed, brittle, with rather large finely pointed scarious or scarious-herbaceous scales at the base of nodes, glabrous, densely calcareo-punctate, scabrous; flowers borne on the upper 1/2 or 1/3 of the scape; spike loosely 5-15 (20)-spiculed; spicules single-flowered, rarely 2-flowered; bracts 3 in single-flowered spicules; outer bract 5-9 mm long and 3-5 mm broad, rigidly herbaceous, broadly scarious-margined (more broadly at apex), broadly ovate, long-acuminate; first inner bract 4-7 mm long and 2-3 mm broad, scarious, irregularly rounded-triangular, the asymmetrical midrib produced into a soft awn 2-2.5 mm long; second inner bract 8-11 mm long, involute and tightly enclosing the calyx, rigidly herbaceous, green, narrowly scarious-margined (more broadly at base), obliquely truncate, with a narrow rounded-triangular single-sided limb 2-4 mm broad; calyx ca. 12-14 mm long and 1-1.5 mm in diameter, tubular

(the limb nearly erect), the tube faintly ribbed, scarious, the narrow herbaceous nerves covered with very short hairs; calyx limb deeply parted (to 1.5-2 mm) into 5 long narrowly linear-lanceolate primary lobes with nerves very nearly reaching the margin, and 5 much shorter nerveless intermediate lobes; petals pale pink. Fl. April-June; fr. May-June (Plate XIX, Figures 2, 2a, 2b).

Stony and fine-earth slopes in the foothills and low mountains, commonly in wormwood-ephemeroid associations. — Soviet Central Asia: Syr D. (Alumtau, Mogoltau), Pam.-Al. (Ura-Tyube, Dzhizak; Pistalitau and Nuratau Mts., Pendzhikent, Zirabulak, Baisun, Kugitang Range). Endemic. Described from the vicinity of Leninabad (Andersai, and Kharlytau foothills). Type and paratype in Leningrad.

3. **Ch. limbatum** Lincz. in Tr. Tadzh. bazy AN SSSR, VIII (1940) 595. — Ic.: Lincz. *ibid.*, Fig. 3.

376 Perennial, 10-20 cm long; root fairly stout; caudex subspherical with a dense coat of leaf remnants, sometimes shortly 2- or 3-parted; leaves all subradical, glaucous, very densely calcareo-punctate, fairly uniform; spring leaves (on the outside), fairly fleshy, 4-6 cm long, linear-obcuneate in lower part, oblongly enlarged to rounded-hastate further up, ca. 4-8 mm broad, subacuminate at apex, the soft slender bristle 3-5 mm long, the margin sparsely short-papillose; summer leaves more broadly and distinctly hastate in upper part, the bristle up to 6 mm long, the margin densely short-papillose, otherwise resembling the spring leaves; scapes commonly 4-8, erect, simple, nearly straight, jointed, brittle, with rather large finely pointed scarious or scarious-herbaceous scales at the base of nodes, glabrous, densely calcareo-punctate, scabrous; flowers borne on the upper 1/2 or 2/3 of the scape; spike loosely 5-15-spiculed; spicules 2-flowered, rarely single-flowered; bracts 3 in single-flowered spicules; outer bract 10-12 mm long and 5-6 mm broad, rigidly herbaceous, broadly scarious-margined (more broadly at apex), broadly triangular-ovate, rather gradually acuminate at apex; first inner bract (doubled in 2-flowered spicules) 9-11 mm long and 2.5-3.5 mm broad, scarious, irregularly triangular-lanceolate, the asymmetrical midrib produced into a fairly long point; second inner bract (always solitary) 12-19 mm long, involute and tightly enclosing the calyx, rigidly herbaceous, green, narrowly scarious-margined (more broadly at base), obliquely truncate, with a broad irregularly ovate or irregularly cordate single-sided limb 5-9 mm broad; calyx 17-20 mm long and 2-2.5 mm in diameter, tubular (the limb nearly erect), the tube strongly ribbed, with broad herbaceous nerves, densely covered with short hairs (more densely on the nerves); calyx limb deeply parted (to 2.5-3 mm) into 5 long narrowly linear-lanceolate acute primary lobes, with nerves nearly reaching the margin, and 5 much shorter nerveless intermediate lobes. Fl. April-May; fr. May-June.

Outcrops of red sandstone (? and limestone) in low mountains. — Soviet Central Asia: Syr D. (Mogoltau), Pam.-Al. (Ura-Tyube, Baisun, Shirabad). Endemic. Described from the vicinity of Gaz village between Shirabad and the Kugitang Range. Type in Leningrad.

377 Calyx subtubular, scarious, the nerves fairly broad, herbaceous, in lower part approximate, the limb narrowly campanulate, 10-lobed, the base strongly oblique; corolla small, exceeding the calyx by less than half a length; petals nearly distinct except at base where connate into a cup, slightly reflexed at the tips, in lower part tubularly coherent by overlapping of margins, becoming incurved after anthesis; filaments of stamens distinct in upper part, in basal part (up to about the middle of ovary) cyathiformly connate, at base strongly dilated (nearly to petal breadth) and here connate and adnate to petals, bare; styles distinct from base, bare; stigmas depressed-capitate (irregularly hemispherical); ovary narrowly fusiform-linear, very gradually and imperceptibly passing into the style; fruit oblong-linear, not enlarged at the top, dehiscent with a small lid and with valves. Perennial plants with a short woody caudex, fairly thick fleshy rosulate leaves, and small pale pink flowers in 1-5-flowered spicules; spikes loose, borne on very slender compoundly panicked scapes.

A monotypic genus, known from the Caucasus (Dagestan) and E. Turkey (upper part of the Euphrates R. basin).

1. **L. Overinii** (Boiss.) Lincz. comb. n.—*Statice Owerini* Boiss. Fl. or. IV (1879) 870; Kuzn. in Mat. Fl. Kavk. IV, 1, 223; Grossg. Fl. Kavk. ed. 1, III, 219.—*Limonium Owerinii* Ktze. Rev. gen. II (1891) 396; Grossg. Opred. rast. Kavk. 594.—Exs.: Sintenis, It. or. 1890, No. 2239; Fl. cauc. exs. No. 21 (sub *Statice*).

378 Perennial, 20-50 cm tall; root fairly stout; caudex woody, many-headed, short-branched, rather densely clothed in remnants of leaf petioles; leaves all subradical, few, glaucous-green, fairly thick and fleshy, broadly obovate to oblong-spatulate, 0.5-1.5 (3) cm long and 0.2-1 cm broad, minutely and rather densely ciliate-scarious on the margin (more densely at base and in young leaves), rounded at apex, apiculate-mucronate, at base gradually passing into a broad flat and usually very short petiole; scapes 2-5 (10), erect, at base terete and densely and minutely hispidulous, further up faintly angled and glabrous, rather strongly flexuous, from low down repeatedly paniculately long-branched, very slender, the branches slender virgate; spicules 6-8 mm long, solitary at 1-2 cm apart on long terminal and mostly arched-recurved scape branches; spicules 1-3 (5)-flowered; flowers borne on pedicels up to 2 mm long; outer bract ca. 1.5 mm long, triangular-ovate, acuminate, narrowly scarious-margined, glabrous; first inner bract resembling the outer bract but about 2 1/2 times as long, in the apical herbaceous part often with 2 or 3 cusps (these not produced beyond the scarious margin, strongly incurved to subinvolute, clasping the flowers, rather narrowly scarious-margined, glabrous; the remaining inner bracts (one per flower) much smaller, scarious, the midrib not reaching the apex; calyx 5-7 mm long, subtubular, the tube ca. 3-4 mm long and 0.5 mm in diameter, glabrous except for isolated short hairs on one side of the base; calyx ca. 2-3 mm broad, white, 10-lobed, the small (ca. 1 mm long) acutely triangular acuminate primary lobes with midrib

* From Greek *leimon* = meadow, meadow plant, and *opsis* = appearance, on account of resemblance to species of the genus *Limonium* Mill.

reaching the margin or slightly excurrent, the much smaller scarious nerveless intermediate lobes rounded at apex; petals pale pink. Fl. June-August; fr. July-September.

Stony mountain slopes, calcareous rocks, and bluffs.—Caucasus: Dag. (middle part of Sulak R. basin in the Chirkat and Botlikh area). **Gen. distr.:** Bal.-As. Min. (extreme E. upper reaches of the Euphrates R. near the village of Egin). Described from Dagestan (vicinity of the village of Chirkat). Type in Leningrad.

Genus 1137. **IKONNIKOVIA** * LINCZ.

Lincz. in Addenda XVII, 745.

Calyx subtubular, scarious, with narrowly campanulate 5-lobed limb, the 5 nerves herbaceous, bare on the inside, the base straight; corolla about twice the length of calyx; petals nearly distinct except at base where annularly connate, reflexed at the tip, overlapping at the margins in lower part to form a tube, incurved after anthesis; filaments of stamens nearly distinct, at base adnate to petals, rather strongly dilated in lower part, bare; styles distinct from base, in lower part minutely verrucose (not villous); stigmas subspherically depressed capitate; ovary narrowly linear-cylindrical, strongly narrowed at the top, very gradually and imperceptibly passing into the style; fruit oblong-linear (not enlarged at the top), dehiscing 381 with a small lid and with valves. A small shrub, with short stout branches, rather broad rigidly coriaceous densely rosulate leaves; flowers large, violet-red; spicules 3-4-flowered, in compact spikes on the lateral branches of simply paniced scapes.

A monotypic genus, known from the Ili River basin in Soviet Central Asia and Sinkiang.

1. **I. Kaufmanniana** (Rgl.) Lincz. comb. n.—*Statice Kaufmanniana* Rgl. in Tr. Bot. Sada, VI, 2 (1880) 300 and in Gartenfl. XXIX (1880) 1.—*Limonium Kaufmannianum* Ktze. Rev. gen. II (1891) 395.—*Goniolimon Kaufmannianum* Voss in Vilm. Blumeng. 3 Aufl. I (1896) 614; Fedch. O. and B. Perech. rast. Turk. V (1913) 180; M. Popov, Fl. Almat. zapovedn. (1940) 37.—Ic.: Gartenfl. l.c. tab. 996.

A frutescent plant 15-50 cm tall, including scapes; root stout; branches usually numerous, up to 5-10 cm long, stout, densely clothed in leaf remnants; leaves in dense rosettes at the ends of branches, numerous, rigidly coriaceous, green or glaucescent-green, linear-lanceolate or lanceolate to oblong-obovate, 3-8 (10) cm long and 0.6-1.5 (2.5) cm broad, rather gradually acuminate or round-tipped, terminating in a short thick sometimes uncinat point, at base mostly very gradually passing into a broad flat petiole, rather densely calcareo-punctate, glabrous or minutely villousulous beneath, the margin densely and minutely ciliate-scabrous and rather coarsely crisped-undulate; scapes mostly numerous, 5-15, erect, terete, rather slender, firm (not brittle), in upper part simply paniced, rarely simple (with a solitary spike), numerous, with small oblong-ovate or ovate long-acuminate scarious-herbaceous scales at the nodes, rather densely villous-scabrous; spikes very compact, 1.5-3.5 cm long, oblong

* Named after N. P. Ikonnikov-Galitskii (1892-1942), investigator of Mongolian flora of the genera *Limonium* Mill., *Goniolimon* Boiss., etc.

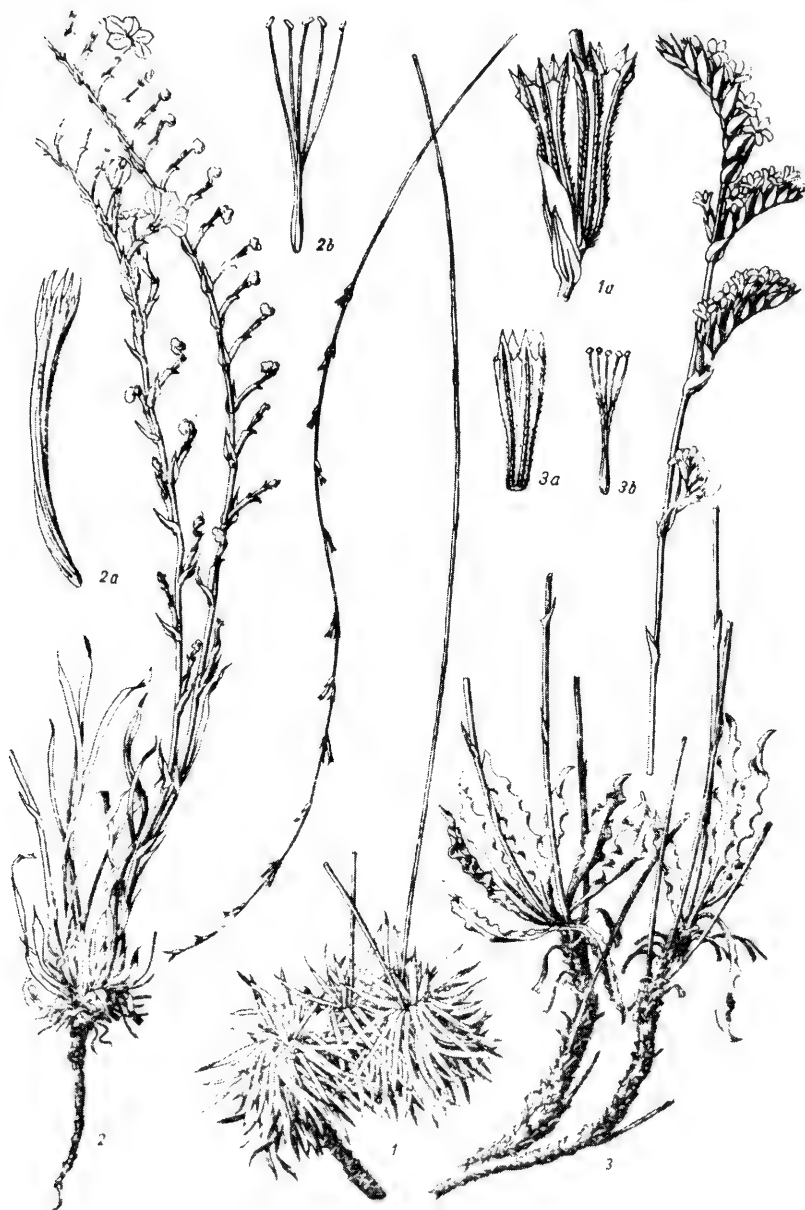


Plate XIX

1. *Acantholimon mirandum* Lincz., 1a) spicule. 2. *Chaetolimon setiferum* (Bge.) Lincz., 2a) calyx, 2b) ovary. 3. *Ikonnikovia Kaufmanniana* (Rgl.) Lincz., 3a) calyx, 3b) ovary.

and usually slightly curved, (4) 7-11-spiculed, very remote, nearly always borne on the main axis; spicules ca. 10 mm long, (2) 3-4-flowered; bracts in 4-flowered spicules 6-10; outer bract ca. 10 mm long, not exceeding or slightly exceeding the calyx, irregularly and broadly ovate, rigidly herbaceous, very broadly scarious-margined, terminating in a rather broad stout cusp (up to 3 mm long), glabrous or hispidulous on the back; first inner bract resembling the outer bract, mostly 1- or very rarely
382 2-cuspidate, the herbaceous part (including the points) usually rather densely hispid; the remaining inner bracts (one per flower) normally much shorter, lanceolate to linear-lanceolate, scarious, the narrow bare or hirsute midrib terminating in a short point; calyx ca. 8 mm long and 1.5 mm in diameter, subtubular (the limb poorly developed), the tube distinctly ribbed, the rather narrow herbaceous nerves rather densely covered throughout with long subappressed stiff hairs; calyx limb with 5 triangular or ovate-lanceolate acute or obtusish lobes up to 2 mm long and nerves clearly terminating below the margin, often coarsely erose-dentate between the lobes or with very small intermediate lobes; petals violet-red, shallowly emarginate at apex. Fl. May-June; fr. June-July (Plate XIX, Figures 3, 3a, 3b).

Stony or rarely fine-earth mountain slopes, taluses, and rocks in low mountains. — Soviet Central Asia: Tien Shan (N. slopes of the Trans-Ili Ala Tau Range and the Ketmen Mts. from Turgeni to Kel'dzhat). **Gen. distr.:** Dzu.-Kash. (Ili R. basin and the Kuldja area). Described from the area of the village of Khanakhai, Podgornoe, and the Kash River valley. Type and paratype in Leningrad.

Note. Leaf breadth varies greatly in this species. Z. B. Kubanskaya noted on the basis of this characteristic a distinct variety (in herb). — var. *latifolia* Z. Kub. (Sogoty Mts., near streams, 14 June, 1937, E. Gorbunova), with leaves up to 2.5 cm broad. The significance of this form should obviously be tested on ample material in nature and in cultivation. Among Regel's typical samples (from three locations) there are both very narrow-leaved (these are represented in our drawing after material from the area of the village of Khanakhai), and rather broad-leaved plants, such as appear in the drawing in "Gartenflora" made from cultivated specimens (grown from seeds supplied by Regel).

Economic importance. Of interest as ornamental plants for exposed ground. Introduced into cultivation about 1880 in the Petersburg Botanical Garden*, whence it spread to the gardens of Western Europe.

Genus 1138. **GONIOLIMON** ** BOISS.

Boiss. in DC. Prodr. XII (1848) 632.

Calyx broadly or narrowly funnelform, scarious, the 5 rather broad herbaceous nerves bare on the inside, the limb fairly broad, more or less distinctly 5- or 10-lobed, white, the base straight or distinctly oblique; corolla slightly exceeding or rarely half as long again as the calyx; petals
383 nearly distinct except at base where annularly connate, slightly reflexed at the tips and shallowly emarginate, in lower part forming a tube by

* [Leningrad.]

** From Greek *gonum* = angle, and *leimon* = meadow, meadow plant.

overlapping, after anthesis incurved; filaments of stamens distinct except at base where adnate to petals, distinctly dilated in lower part, bare; styles distinct from base, villous in lower part with rather long hairs; stigmas subspherically depressed-capitate; ovary ovoid or oblong-ovoid, slightly narrowed at the top, the transition between ovary and style distinct; fruit oblong-ovoid, dehiscent with a small lid and with valves. Perennial plants with a short and sometimes woody caudex; leaves rather broad, rigidly fleshy, in basal rosettes; flowers violet-rose; spicules 2-6-flowered; spikes fairly loose or dense, borne on terminal usually more or less angled or winged branches of compoundly paniced or sometimes subcorymbose scapes.

The genus is known to contain about 20 species, distributed from North Africa (Algeria) to Mongolia. There are 13-15 species in the USSR.

Economic importance. Some species (*G. callicomum*, *G. elatum*, *G. eximium*, *G. speciosum*, *G. tataricum*) are sometimes cultivated as ornamentals for open ground, on account of their striking appearance and relatively modest requirements. Certain species contain a small amount of tannins in the roots, but so far they have not been used for tanning.

- 1. First inner bract with (1) 2 or 3 broad and stout, rigidly herbaceous cusps (Plate XX, Figure 2)*. 3.
- + First inner bract always with a single rigidly herbaceous cusp and with or without lateral membranous lobes 2.
- 2. Lateral membranous lobes of first inner bract wanting or very small and inconspicuous; calyx 5-6.5 mm long, with limb 1.5-2 mm broad. 1. *G. elatum* (Fisch.) Boiss.
- + Lateral membranous lobes of first inner bract large; calyx 7-8.5 mm long, with limb 3-4 mm broad 2. *G. Severzovii* Herd.
- 3. Calyx broadly funnellform, rather obtusely short-lobed (Plate XX, Figure 1a). 4.
- + Calyx narrowly funnellform, rather narrowly long-lobed (Plate XX, Figure 2) 9.
- 384 4. Scapes (in well developed specimens) always more than twice branched, in upper part angled or narrowly winged (though sometimes not crisped undulate-winged), nearly always with short (rarely — Chuiskaya Steppe and Tuva** — with fairly long) pubescence; spikes rather loose or dense and forming small heads 5.
- + Scapes not more than 2-branched, in upper part terete or scarcely angled, often rather broadly crisply undulate-winged and nearly always with very dense and long pubescence; spikes densely capitate, forming large compact heads 7.
- 5. Spikes rather loose (the spicules markedly distant) 8.
- + Spikes dense, in rather compact small heads 6.
- 6. Plants up to 50 cm tall; leaves on the average 6-10 (rarely up to 15) cm long (mostly in plains) 3. *G. speciosum* (L.) Boiss.
- + Plants up to 80 cm tall; leaves on the average 10-15 cm (often up to 20 cm) long (Dzungarian Ala Tau and Tarbagatai) 4. *G. dschungaricum* (Rgl.) O. et B. Fedtsch.

* It is necessary to examine several spicules from different parts of the inflorescence.
** [Tuva Autonomous Region.]

7. Leaves always quite bare and smooth on the surface and on the margin, up to 20 cm long, the petiole from one-half or two-thirds as long as to equaling the blade; bracts rather broadly scarious-margined; scapes never crisped undulate-winged 5. **G. eximium** (Schrenk) Boiss.
- + Leaves nearly always finely ciliate-margined, with sometimes puberulous surface, up to 10 cm long, the petiole nearly always one-third to one-half the length of blade; bracts very broadly scarious-margined; scapes in upper part often rather broadly crisped undulate-winged 6. **G. orthocladum** Rupr.
8. Leaves oblong-elliptic to lanceolate; scapes branched in upper half or two-thirds; first inner bract with short cusps 7. **G. callicomum** (C. A. M.) Boiss.
- + Leaves rather broadly ovate to suborbicular; scapes branched nearly from base; first inner bract with cusps up to 4 mm long 8. **G. cuspidatum** Gamajun.
9. Calyx tube rather densely pubescent; leaves and scapes glabrous or rather densely pubescent. 10
- + Calyx tube glabrous; leaves and scapes glabrous 11. **G. Bessierianum** (Schult.) Kuzn.
10. Leaves elliptic-lanceolate or narrowly lanceolate or narrowly linear; scape branches narrowly winged or merely angled; spicules 1- or 2-flowered, in long and rather loose spikes 11.
- + Leaves broadly lanceolate or oblong-obovate, 1-3.5 cm broad; scape branches usually rather broad-winged; spicules 2-3-flowered, in short and rather dense spikes 9. **G. tataricum** (L.) Boiss.
11. Leaves oblong-lanceolate to sublinear or elliptic-lanceolate, occasionally oblong-obovate, 0.5-1 cm broad; scape branches narrowly winged or angled; spicules subdistant; outer bract about equaling the first inner bract. 10. **G. rubellum** (S. G. Gmel.) Klok.
- + Leaves narrowly linear, 0.1-0.4 (rarely up to 0.7) cm broad; scape branches angled or very narrowly winged; spicules distant; outer bract much shorter than the first inner bract (about one-third to one-half as long) 12. **G. graminifolium** (Ait.) Boiss.

Section 1. **UNICUSPIDARIA** Lincz. sect. n. in Addenda XVII, 745. — First inner bract always unicuspidate. Section type: *G. elatum* (Fisch.) Boiss.

Series 1. **Elata** Lincz. — Calyx broadly funnelform, with short broad subobtusate lobes; scape branches more or less angled, but not winged. Series type: *G. elatum* (Fisch.) Boiss.

1. **G. elatum** (Fisch.) Boiss. in DC. Prodr. XII (1848) 634; Fedch. O. and B. Perech. rast. Turk. V, 180; Leisle in Fl. Yugo-Vost. VI, 38; Kryl. Fl. Zap. Sib. IX, 2164. — *Statice elata* Fisch. in Catal. Horti Gorenk. (1812) 18, nomen, et ex Spreng. Syst. veg. I (1825) 957; Ldb. Fl. Ross. III, 466; Regel in Tr. Bot. Sada, VI, 2, 388, in append.; Shmal'g. Fl. II, 189. — *S. flexuosa* Less. in Linnaea, IX (1835) 196, non L. — *Limonium elatum* Ktze. Rev. gen. II (1891) 395.

Perennial, 30-85 cm tall; root stout; caudex usually strongly thickened by a coat of leaf remnants, shortly 2-4-branched; leaves all radical,

fairly numerous, coriaceous, pale green or glaucescent, all glabrous and smooth, oblongly lance-spatulate to obovate, (5) 8-15 (20) cm long and (2.5) 3-4 (5) cm broad, rather gradually acuminate to obtusely round-tipped, shortly and slenderly spiculate-mucronulate, very gradually cuneately tapering into and several times as long as the broad flat petiole; scapes commonly 1-2 (3), erect, terete stoutish and glabrous in lower part, compoundly paniced in upper part, the branches slender, angled (but not winged), irregularly puberulous or glabrate; spikes oblong, 1.5-2.5 cm long and ca. 0.7 cm broad, rather loosely 7-13-spiculed, rather distinctly distichous, commonly sessile, gathered in a fairly broad sometimes subcorymbose panicle; spicules ca. 6-7 mm long, 2-3 (4)-flowered; bracts 5 in 3-flowered spicules, all glabrous except for the irregularly pubescent base of outer bract, usually shorter than to equaling or sometimes exceeding the calyx tube; outer bract ca. 5 mm long, about equaling the first inner bract, irregularly and broadly ovate, rigidly herbaceous, strongly cuneate, rather broadly scarious-margined, terminating in a fairly broad stout cuneate cusp ca. 1 mm long, lateral membranous lobes absent or very small and inconspicuous; first inner bract resembling and usually scarcely longer than the outer bract; other inner bracts (one per flower) slightly shorter and narrower, nearly all scarious, with a rather narrow midrib and a slender cusp; calyx ca. 5-6.5 mm long, funnellform, the tube 3.5-4.5 mm long and 1 mm in diameter, with broad and thick herbaceous nerves, densely covered in lower part with fairly long hairs, especially on the nerves; calyx limb ca. 1.5-2 mm broad, rather distinctly 5-lobed, the short irregularly and broadly triangular lobes, the slender bare nerves reaching the margin or slightly excurrent; petals white (?). Fl. June-July; fr. July-August.

Chalk and limestone outcrops, slopes of gullies, in needlegrass and needlegrass-mixed-grass steppes, mostly in elevated places. — European part: V.-Kama (extreme S.), V.-Don (E. part), Transv., L. Don (NE part), L. V. (N. part); W. Siberia: U. Tob., Irt.; Soviet Central Asia: Ar. - Casp. (N. part), Balkh. (N. part). Endemic. Described from cultivated specimens grown in Gorienki from seeds collected in the Volga region (?). Type in Leningrad (?).

2. **G. Severzovii** Herd. in Bull. Soc. Nat. Mosc. XLI (1868) 396 ("Sewerzowii"); Fedch. O. and B. Perech. rast. Turk. V (1913) 178, p.p. excl. syn. Rupr. — *Statice Sewerzowii* Rgl. (incl. var. α . *typica* Rgl. et var. β . *alata* Rgl.) in Tr. Bod. Sada, VI, 2 (1880) 386, in append. — *S. alata* Rgl. et Schm. in Tr. Bot. Sada, V (1877) 259. — *Limonium Sewerzowii* Ktze. Rev. gen. II (1891) 396.

Perennial, 35-100 cm tall; root stout; caudex usually strongly thickened by a coat of leaf remnants, to subspherical, shortly 2-4-branched; leaves all radical, fairly numerous, thinly coriaceous, pale green, all glabrous and smooth, oblongly lance-spatulate to obovate, (10) 15-25 (50) cm long and (2.5) 5-8 (10) cm broad, obtusely round-tipped or subacuminate, slenderly apiculate-mucronate, at base very gradually cuneately tapering into and several times as long as the broad flat petiole; scapes mostly 1 or 2, erect, terete, commonly stout, in upper part compoundly paniced, the branches slender, slightly angled (but not winged), glabrate except for parts of terminal branchlets to rather densely puberulous; spikes oblong, 2-3.5 cm long and ca. 1 cm broad, rather compactly 7-13-spiculed, rather

distinctly distichous, commonly sessile, gathered in a broad and occasionally subcorymbose panicle; spicules ca. 10 mm long, (2) 3-4 (5)-flowered; bracts 6 in 4-flowered spicules, all glabrous (or merely the outer bract irregularly pubescent at the very base), equaling or slightly exceeding the calyx tubes; outer bract ca. 5-6 mm long, slightly shorter than or equaling the first inner bract, irregularly and broadly ovate, rigidly herbaceous, strongly cuneate, broadly scarious-margined, terminating in a broad and stout cusp up to 3 mm long and usually with 2 rather large lateral membranous lobes; first inner bract resembling the outer bract but more irregular and more strongly lobed; other inner bracts (one per flower) slightly shorter and narrower, otherwise rather similar; calyx ca. 7-8.5 mm long, funnelform, the tube ca. 4-5 mm long and 1.5 mm in diameter, with broad and thick herbaceous nerves, densely covered throughout with fairly long hairs; calyx limb ca. 3-4 mm broad, distinctly 5-lobed, the lobes broad, rounded-triangular and slightly acuminate, the broad green bare nerves mostly terminating slightly above the middle of the limb; petals pale rose. Fl. July-August; fr. August.

Dry stony and fine-earth (sometimes steppe) slopes in the intermediate (tree and scrub) mountain zone. — Soviet Central Asia: Tien Shan (Tashkent Ala Tau, Karatau, Fergana, and Kirghiz Ala Tau ranges, Lake Issyk-Kul'). Endemic. Described from W. Tien Shan (Chirchik River basin). Type in Leningrad.

Section 2. **TRICUSPIDARIA** Lincz. sect. n. in Addenda XVII, 745. — First inner bract with (1) 2 or 3 broad and stout rigidly herbaceous cusps. Section type: *G. speciosum* (L.) Boiss.

Subsection 1. **PLATYCALYX** Lincz. subsect. n. in Addenda XVII, 745. — Calyx broadly funnelform, with short broad obtusish lobes. Subsection type: *G. speciosum* (L.) Boiss.

388 Series 1. **Speciosa** Lincz. — Spikes dense, gathered in small heads; scapes compoundly branched, the branches angled or straight-winged (not crisped undulate). Series type: *G. speciosum* (L.) Boiss.

3. ***G. speciosum*** (L.) Boiss. in DC. Prodr. XII (1848) 634; Turcz. in Bull. Soc. Nat. Mosc. XXV, 3, 394 (Fl. baic.-dah. No. 926); Leisle in Fl. Yugo-Vost, VI, 37. — *G. speciosum* [var.] *α. genuinum* Herd. in Bull. Soc. Nat. Mosc. XLI (1868) 395; Kryl. Fl. Zap. Sib. IX, 2162. — *G. speciosum* var. *typicum* O. et B. Fedtsch. Perech. rast. Turk. V (1913) 179. — *Statice speciosa* L. Sp. pl. (1753) 275; Ldb. Fl. alt. I, 436, p.p. excl. syn. Sievers. et Fl. Ross. III, 465. — *S. speciosa* var. *α. typica* Rgl. in Tr. Bot. Sada, VI, 2 (1880) 389, 387, in append. — *S. speciosa α. genuina* Kryl. Fl. Alt. IV (1907) 1078. — ? *S. conspiciua* Sims in Bot. Mag. XXXIX (1814) tab. 1629. — *Limonium speciosum* Ktze. Rev. gen. II (1891) 396. — Ic.: Gmel. Fl. Sib. II, tab. 91, f. 1; Hill, Veg. Syst. V, tab. 13; Bot. Mag. XVIII, tab. 656; Lodd. Bot. Cab. XIV, tab. 1336. — Exs.: Kar. et Kir. Pl. Songor. No. 414; GRF, No. 727; P. Smirn. Pl. alt. exs. No. 62.

389 Perennial, 10-50 cm tall; root fairly stout; caudex strongly thickened by a coat of leaf remnants, simple or with 2-4 branches; leaves all radical, fairly numerous, rather rigid, pale green or cinerescent-green, sometimes turning red, minutely calcareo-punctate, bare or finely ciliate on the margin, commonly glabrous or rarely minutely puberulous on the surface, broadly lanceolate (rarely) or oblong-ovate to rounded-obovate, (3) 6-8 (rarely up to 15) cm long and (1) 2-3 (rarely up to 5) cm broad, rather gradually acuminate or nearly round-tipped, slenderly apiculate-cuspidate, at base very gradually cuneately tapering into, and 2-3 times as long as or rarely about equaling, the broad flat petiole; scapes mostly 1 or 2, erect, in lower part terete, fairly stout, puberulous or glabrous, in upper part (except in poorly developed specimens) compoundly paniced, the branches slender, angled or narrowly winged, rather densely and nearly always shortly pubescent; spikes 1.5-2.5 cm long and ca. 1-1.5 cm broad, compactly (5) 7-11 (15)-spiculed, secund, imbricated-distichous, commonly sessile and markedly recurved, gathered in fairly broad and sometimes subcorymbose panicles; spicules ca. 8 mm long, (2) 3-4 (5)-flowered; bracts 5 in 3-flowered spicules, glabrous to rather densely puberulous (also on the inside); outer bract ca. 7-8 mm long, from slightly shorter than to somewhat exceeding the calyxes, broadly rounded-ovate, rigidly herbaceous and very broadly scarious-margined, broadly mucronate; first inner bract resembling the outer one, with (1) 2 or 3 cusps — rather large unequal narrowly triangular or (the lateral ones) obtusish — and two rather broad rounded lateral membranous lobes; other bracts (one per flower) slightly shorter, scarious, with or without a narrow midrib, slenderly mucronate or muticous; calyx ca. 7-8 mm long, funnelform, the tube ca. 4-5 mm long and 1 mm in diameter, with broad herbaceous nerves, densely covered throughout in lower one-half or two-thirds and higher up merely on the nerves with rather long hairs; calyx limb ca. 2.5-3 mm broad, obscurely 5-lobed, the lobes short broad round-tipped or acutish, sometimes minutely denticulate on the margin (sometimes alternating with small obsolescent intermediate lobes, the nerves bare or at the very base pubescent and not reaching beyond the middle of the limb; petals violet-rose. Fl. June-July; fr. July-August (Plate XX, Figures 1, 1a, 1b).

Steppes in plains and mountains, in stony fine-earth, sometimes saline soils. — European part: V.-Kama (S. part adjacent to the Urals), Transv.; W. Siberia: U. Tob., Irt., Alt.; E. Siberia: Lena-Kol. (a "steppe island" in the Yakut ASSR area), Ang.-Say., Dau.; Soviet Central Asia: Ar.-Casp. (N. part), Balkh. (N. part), Dzu.-Tarb. (to the S. slopes of the Dzungarian Ala Tau). **Gen. distr.:** Dzu.-Kash. (N. part), Mong. Apparently described from cultivated specimens grown in Uppsala from seeds obtained from "Tatariya" (probably from the Transvolga region*. Type in London.

Note. A widely distributed, chiefly steppe, species. Its geographical races are not as yet sufficiently well known; one of them is included below as *G. dschungaricum* (Rgl.) O. et B. Fedtsch. One should also mention a characteristic mountain-desert form reported by P. N. Krylov as *G. speciosum* var. *multicaule* Kryl. (l.c.), known from the Altai (Chuiskaya Steppe), in Tuva Autonomous Region and western Mongolia, distinguishable by its low growth (up to 10-12 cm), less compound panicles (mostly only two-branched), densely rather long-pubescent scapes with

* [The area immediately east of the Volga.]

relatively very large scales; the leaves of this form vary from obovate or oblong-ovate (normal for *G. speciosum*) to narrowly lanceolate, as in *G. callicomum* (C.A.M.) Boiss. Might not the old (Bunge) and so far unconfirmed reports of *G. callicomum* for the Chuiskaya Steppe refer to such narrow-leaved specimens? It is possible that here belongs also the mysterious name *Statice conspicua* Sims (l.c.) which up till now we have not succeeded in decoding. In areas where *G. speciosum* and *G. elatum* occur in close proximity, hybridization apparently occurs between the two species.

- 390 4. *G. dschungaricum* (Rgl.) O. et B. Fedtsch. Perech. rast. Turk. V (1913) 179. — *G. speciosum* var. *lanceolatum* O. et B. Fedtsch. l.c. 179. — *G. tarbagataicum* Gamajun. in Vestn. AN Kazakhsk. SSR, 1 (1951) 80. — *Statice dschungarica* Rgl. in Tr. Bot. Sada, VI, 2 (1880) 386. — *S. speciosa* var. *δ. lanceolata* Rgl. l.c. 389, 387, in append. — Ic.: Gamayunova, l.c. Fig. 3.

Perennial, 25-80 cm tall; root fairly stout; caudex strongly thickened by a coat of leaf remnants, simple or with 2-4 short branches; leaves all radical, fairly numerous, rather rigid, pale green or beneath glaucescent-green, sometimes turning reddish, glabrous except for the finely ciliate margin, minutely calcareo-punctate, oblong-obovate or broadly lanceolate to broadly obovate, (6) 10-15 (20) cm long and (2) 3-4 (6) cm broad, rather gradually acuminate to nearly round-tipped, finely mucronate, at base very gradually tapering into and markedly longer than the very broad flat petiole; scapes mostly 1 or 2, erect, at base terete, commonly stout (sometimes up to 1 cm in diameter), glabrous or rarely pubescent, in upper part compoundly paniced, the branches rather slender, angled or very narrowly winged, rather densely puberulous to rarely glabrate; spikes 2-2.5 cm long and ca. 1.5 cm broad, compactly (7) 10-15-spiculed, secund, imbricated-distichous, commonly sessile, and markedly recurved, gathered in broad sometimes subcorymbose panicles; spicules ca. 8-9 mm long, (2) 3-4 (5)-flowered; bracts 5 in 3-flowered spicules; outer bract ca. 7-9 mm long, from slightly shorter than to somewhat exceeding the calyxes, glabrous or rarely in upper part pubescent along the margin, rounded-ovate, very broadly scarious-margined, terminating in a broad triangular cusp; first inner bract slightly shorter and narrow, with (1) 2-3 large unequal narrowly triangular cusps and fairly broad and rounded lateral scarious lobes, otherwise similar; other inner bracts (one per flower) slightly shorter, scarious, with or without a narrow midrib, slenderly mucronate or mucous; calyx ca. 7-8.5 mm long, funnelform, the tube ca. 5 mm long and 1 mm in diameter, with broad herbaceous nerves, densely covered throughout in lower two-thirds and usually only on the nerves above with fairly long hairs, sometimes in upper one-third glabrous; calyx limb ca. 2.5-3 mm broad, 5- or obscurely 10-lobed, the primary lobes short, broadly triangular, acutish or obtusish, the intermediate lobes smaller, not reaching beyond the middle of the limb, bare or at the very base pubescent; petals violet-rose. Fl. June-July; fr. July-August.

- 391 Stony and fine-earth mountain slopes, in steppe or mixed-grass-meadow associations, in the intermediate mountain zone. — Soviet Central Asia: Dzu.-Tarb. (Dzungarian Ala Tau and Tarbagatai ranges). **Gen. distr.:** Dzu.-Kash. (N. part). Described from the Dzungarian Ala Tau (Koks River basin). Type in Leningrad.

Note. Very similar to *G. speciosum* (L.) Boiss. Distinguishable by, on the average, taller growth (up to 80 cm), larger (up to 20 cm long) and more oblong leaves, and longer panicle branches. Regel distinguished this species from *G. speciosum* by 2-flowered spicules, but these are in actual fact 2-5-flowered. A study of *G. dschungaricum* is needed under natural conditions, on sufficiently ample material. It is necessary, in particular, to clarify the relationship to *G. speciosum* which in its more or less typical form reaches as far as the Dzungarian Ala Tau, but evidently grows in different conditions from *G. dschungaricum*.

Series 2. **EXIMIA** Lincz.—Spikes dense, gathered in large heads; scapes twice branched, the branches terete or scarcely angled, sometimes crisped undulate-winged. Series type: *G. eximium* (Schrenk) Boiss.

5. ***G. eximium*** (Schrenk) Boiss. in DC. Prodr. XII (1848) 634; Fedch. O. et B. Perech. rast. Turk. V, 178.—*Statice eximia* Schrenk in Fisch. et Mey. Enum. pl. nov. (1841) 13; Ldb. Fl. Ross. III, 462; Regel in Tr. Bot. Sada, VI, 2, 386, in append.—*S. eximia* var. *turkestanica* Rgl. in Gartenfl. XXXVII (1888) 194, 266 (descr.).—*Limonium eximium* Ktze. Rev. gen. II (1891) 395.—Ic.: Bot. Reg. XXXIII (1847) tab. 2; Rgl. in Gartenfl. l.c. tab. 1270.

Perennial, 25-75 cm tall; root stout; caudex more or less thickened, with 2-4 short branches; leaves all radical, rather numerous, rigidly coriaceous, glaucescent-green, all glabrous and smooth, broadly lanceolate or obovate, rather gradually acuminate or rarely subobtusate, always stoutly short-mucronate, usually finely crisped undulate-margined, 5-12 cm long and 2-6 cm broad, very gradually tapering into, and equaling, 1 1/2 times or twice as long as, the fairly broad flat petiole; scapes mostly 2-4, erect, terete fairly stout and rather densely puberulous below, compoundly paniced (twice-branched) in upper part, the branches terete or scarcely angled, densely long-pubescent; spikes 1.5-2 cm long and 1.5-2 cm broad, very compactly (3) 7-11 (13)-spiculed, secund, imbricated-distichous, nearly
392 always sessile, commonly gathered in large heads at the ends of more or less recurved branches, forming a loose, usually rather narrowly pyramidal inflorescence; spicules 10 mm long, (2) 4-6-flowered; bracts 6 in 4-flowered spicules, pubescent or glabrous on the outside; outer bract ca. 8-9 mm long, mostly about equaling the calyxes, irregularly and broadly ovate, rigidly herbaceous, rather broadly scarious-margined, terminating in a fairly broad and stout cusp up to 3 mm long; first inner bract resembling the outer one, but more irregular in shape, subtruncate, with 3 (rarely 2) unequal broad and stout cusps (the conspicuously longer central cusp up to 3 mm long); other inner bracts (one per flower) smaller and narrower, scarious, the narrow midrib produced into a fairly long and rather slender cusp; calyx ca. 8-9 mm long, funnelform, the tube ca. 5 mm long and 1.5 mm in diameter, with fairly broad herbaceous nerves, in lower half or nearly throughout rather densely long-pubescent; calyx limb ca. 3-4 mm broad, distinctly 5-lobed, the lobes broad, nearly regularly triangular and acuminate, the narrow reddish nerves clearly terminating below the margin, this irregularly erose-dentate between the lobes; petals violet. Fl. June-July; fr. July-August.

Fine-earth and gravelly slopes, commonly in steppe associations, in the intermediate and lower mountain zones.—Soviet Central Asia: Dzu.-Tarb.

(northern limit the Saur Range). T. Sh. (N. slopes of the Trans-Ili Ala Tau Range, also in the Kirghiz Ala Tau in the Mt. Frunze area). **Gen. distr.:** Dzu.-Kash. (N. part), Mong. (Dzhirgalantu area, formerly Kobdo). Described from the Dzungarian Ala Tau (Karatau and Labasy Mts. in the upper reaches of the Karatal and Koks rivers). Type in Leningrad.

Note. The variety distinguished by Regel (var. *turkestanica* Rgl.), as far as can be deduced from the description (we have not seen the type), does not differ in any substantial characteristic from the common form.

6. **G. orthocladum** Rupr. in Mem. Acad. Sc. Petersb. VII ser. XIV, 4 (1869) 69; M. Popov, Fl. Almat. zapovedn. 37.—*G. speciosum* β . *alpinum* Herd. in Bull. Soc. Nat. Mosc. XLI (1868) 396; Fedch. O. et B. Perech. rast. Turk. V, 179.—*G. speciosum* var. *crispum* O. et B. Fedtsch. l.c. 179.—*G. Sewerzovii* Herd. in Bull. Soc. Nat. Mosc. XLV, 1 (1872) 380, p.p. quoad syn. Rupr.; Fedch. O. and B. l.c. 178.—*G. crispum* Lipsch. in sched. lithogr. (1932).—*Statice speciosa* var. γ . *crispa* Rgl. in Tr. Bot. Sada, VI, 2 (1880) 389, 387, in append.—*S. speciosa* var. β . *lepidota* Rgl. l.c. p.p.

Perennial, 5-45 cm tall; root fairly stout; caudex strongly thickened by a coat of leaf remnants, with 2-4, rarely up to 6-10 short branches; leaves all radical, fairly numerous, rather rigid, pale green or beneath 393 glaucescent-green, sometimes turning reddish, nearly always finely ciliate-margined, rarely pubescent near the margin and along the veins or nearly throughout, always densely calcareo-punctate (especially beneath), broadly lanceolate to rounded-obovate, (3) 6-8 (10) cm long and (1) 2-3 (4) cm broad, rather abruptly acuminate to nearly round-tipped, finely mucronate, tapering very gradually and cuneately into and mostly 2-3 times as long as the broad flat petiole; scapes commonly 1 or 2, rarely up to 6-10, erect, toward base terete, up to 0.5 cm in diameter, pubescent or rarely glabrous, in upper part, compoundly paniced (twice-branched), the branches subterete or scarcely angled, often (like the rachis) rather broadly crisped undulate-winged and nearly always very densely long-pubescent (very rarely glabrous); spikes 1.5-2 cm long and ca. 1.5 cm broad, very compactly (3) 7-11 (13)-spiculed, secund, imbricated-distichous, nearly always sessile, commonly gathered in large heads at the end of more or less recurved or straight branches, forming a fairly loose, mostly narrowly pyramidal inflorescence; spicules ca. 8-9 mm long, (2) 3-4 (5)-flowered; bracts 5 in 3-flowered spicules, pubescent or glabrous on the outside; outer bract ca. 8-9 mm long, commonly about equaling or slightly exceeding the calyxes, broadly and irregularly obovate, very broadly scarious-margined, terminating in a broad and stout cusp; first inner bract resembling the outer one, with (1) 2 or 3 stout cusps up to 2-3 mm long; other inner bracts (one per flower) scarious, with or without a narrow midrib, finely mucronate or muticous; calyx ca. 7-8 mm long, funnellform, the tube ca. 5 mm long and 1 mm in diameter; with broad herbaceous nerves, densely pubescent nearly throughout in lower two-thirds and usually merely on the nerves higher up; calyx limb ca. 2-2.5 mm broad, rather distinctly 5-lobed or subtruncate, sometimes finely denticulate on the margin, the bare or hairy nerves not reaching beyond the middle of the limb; petals violet-rose. Fl. June-August.; fr. July-September.

Stony and fine-earth slopes, in steppe associations, in the intermediate and higher mountain zones.—Soviet Central Asia: Tien Shan (Centr. and

NE — from the Kirghiz Ala Tau to the Kegen-Ketmen Mts.). **Gen. distr.:** Dzu.-Kash. (E. Tien Shan, as far as the Urumchi area). Described from Dzhaman-Daban Pass (the slopes toward the Arpa River). Type in Leningrad.

Note. A completely glabrous form of this species (except for the calyx tube).— *G. orthocladum* f. *glabrum* Lincz. is known to be of very rare occurrence (Dzil'dysu, Uch-Kosoi, 16 August 1905, V.A. Abramov).

- 394 Attention must also be drawn to the occasional occurrence of specimens with bare (not ciliate) leaf margins, which renders their differentiation from *G. eximium* difficult; in such cases, characteristics like leaf size and the relative length of petiole, the relative (much greater) breadth of the scarious part of bracts, and the crisped undulate scape wings (when present), are all likely to be helpful. Further field study is needed on the ecology of forms associated with high altitudes: the high-mountain alpine form, to which the type specimen refers, and the taller form of the intermediate mountain zone, reported by E. Regel as *Statice speciosa* var. *γ. crispa* Rgl., and later by S.Yu. Lipshits as *G. crispum* (Rgl.) Lipsch.

Series 3. *Callicoma* Lincz.— Spikes loose, with distant spicules; scapes compoundly paniced (repeatedly branched), with angled and narrowly winged branches. **Series type:** *G. callicomum* (C.A.M.) Boiss.

7. *G. callicomum* (C.A.M.) Boiss. in DC. Prodr. XII (1848) 633; Fedch. O. and B. Perech. rast. Turk. V, 180; Kryl. Fl. Zap. Sib. IX, 2163.— *Statice callicoma* C.A.M. in Bong. et Mey. Verzeichn. am Saisang-Nor gesamm. Pfl. (1841) 56 et in Bull. Acad. Sc. Petersb. VIII (1841) 340; Ldb. Fl. Ross. III, 465; Regel in Tr. Bot. Sada, VI, 2, 387. in append.— *S. argentea* Pall. ex Sievers in Pall. N. Nord. Beitr. III (1796) 282, nomen.— *S. incana* Ldb. Fl. alt. I (1829) 435, non L.— *Limonium callicomum* Ktze. Rev. gen. II (1891) 395.— Ic.: Gartenfl. XXX, tab. 1063 (nontypical form represented).— Exs.: Kar. et Kir. Pl. Songor. No. 412.

- Perennial, 10-50 cm tall; root commonly fairly slender; caudex subspherically thickened by a coat of leaf remnants, simple or mostly with 2-6 short branches; leaves all radical, numerous, rigidly fleshy, pale green or cinerescent, mostly all glabrous except for the narrowly cartilaginous finely ciliate margin, rarely puberulous toward the margin, very densely and minutely calcareo-puncticulate, oblong-elliptic to lanceolate, (2) 5-10 (14) cm long and (0.5) 1-1.5 (1.8) cm broad, very gradually acuminate, mucronate, very gradually tapering into and equaling, 1 1/2 times or twice as long as the fairly broad flat petiole; scapes commonly 2-6, sometimes up to 10-15, erect, toward base terete, glabrous or rarely sparsely puberulous, in upper one-half or two-thirds compoundly paniced, the branches rather slender, angled or scarcely winged, rather densely puberulous or rarely glabrate; spikes 2-4 (8) cm long and ca. 1 cm broad, loosely 5-13 (18)-spiculed, rather distinctly distichous, subsessile, gathered in a loosely paniculate or sometimes subcorymbose inflorescence; spicules ca. 7-8 mm long, (2) 3-4-flowered; bracts 5 in 3-flowered spicules; outer bract 3-5 mm long, half as long as or equaling the calyx tube, broadly rounded-ovate, rigidly herbaceous, rather broadly scarious-margined, with a broad and stout cusp; first inner bract resembling the outer one, but usually markedly larger, glabrous or puberulous, subtruncate or (1) 2- or 3-cuspidate and lobed, the cusps short, thick, often pubescent
- 395

on the margin and inside, the membranous lateral lobes fairly large; other inner bracts (one per flower), much shorter, scarious, with a narrow midrib, and with or without a slender cusp up to 1 mm long; calyx ca. 7-8 mm long, funnelform, the tube ca. 5 mm long and 1 mm in diameter, with broad herbaceous nerves, rather densely covered in lower part or entirely, more or less uniformly or sometimes only along two ribs, with fairly long hairs; calyx limb ca. 2.5-3 mm broad, rather distinctly 10-lobed, the primary lobes larger, rounded-triangular, obtusish, the smaller intermediate lobes semiorbicular, the nerves not reaching beyond the middle of the limb; petals pale violet-rose. Fl. May-July; fr. June-July.

Plains or rarely mountains, mostly in stone-and-sand or sandy soils, often on sandhills.— W. Siberia: Irt. (S. part), ? Alt. (? Chuiskaya Steppe); Soviet Central Asia: Ar.-Casp. (E. part, west as far as the Mugodzhary Mts.), Balkh. Dzu.-Tarb. (foothills), T.Sh. (Karatau Range foothills). **Gen. distr.:** Dzu.-Kash. (N. part). Described from the Irtysh River valley in the Lake Zaisan area. Type in Leningrad.

Note. This species is here conceived rather widely, without recognition of minor geographical races, discernible by certain characteristics, as this would hardly serve a useful purpose in the absence of adequate field observations. It should be noted that intermediate (hybrid?) forms occur in areas where *G. callicomum* and *G. speciosum* occur in close proximity. Of such derivation may possibly be a characteristic low-growing form, often collected in the central part of the Ili River valley (in the foothill areas of the Dzungarian and Trans-Ili Ala Tau and of the Ketmen Mts.) and distinguishable by oblong-ovate to rounded-ovate leaves, such as are characteristic of *G. speciosum* (but much longer than in that species and rather abruptly tapering into the petiole), and a rather loose inflorescence (almost like that of *G. callicomum*). We identify this form provisionally with *G. strictum* (Rgl.) Lincz. comb. n. (*Statice speciosa* var. *ε. stricta* Rgl. in Tr. Bot. Sada, VI, 2 (1880) 389, 387, in note.— *S. speciosa* var. *β. lepidota* Rgl., l.c. pp.), a species known from the collections of Regel and Przhevalskii made in certain locations in Singkiang, in the Kuldja area and east of it — in the Kunges River valley; this species should evidently be associated with *G. cuspidatum* Gamajun. as its eastern (Ili) race. As regards the above-mentioned *Statice speciosa* var. *β. lepidota* Rgl., under this name were also mixed in *G. orthocladum* Rupr. of Tien Shan (*S. speciosa* var. *γ. crispa* Rgl., l.c.) and specimens gathered in the southern foothills of the Dzungarian Ala Tau and in the basin of Lake Sairam Nor, in some cases resembling closely *S. speciosa* var. *ε. stricta* Rgl. (l.c.). We therefore propose not to use the Regelian name "var. *lepidota*", especially in view of the fact that the only distinguishing characteristic reported by Regel for this variety — the densely calcareo-punctate leaves — is to a greater or less degree displayed by all species of the genus *Goniolimon*.

8. *G. cuspidatum* Gamajun. in Vestn. AN Kazakhsk. SSR, 1 (1951) 79.— Ic.: Gamayunova, ibid., Fig. 2; Korov. and Mironov in Tr. SAGU, ser. VIII b, 21 (1935), Fig. 12 (as *Statice speciosa* L.).

Perennial (biennial?), 10-35 cm tall; root slender; caudex small, but considerably thickened by a coat of leaf remnants, subspherical, simple; leaves all radical, fairly numerous, rather rigid, greenish-glaucous, sometimes turning reddish, irregularly puberulous or glabrous except for the always densely and finely ciliate cartilaginous margin, minutely tuberculate and densely calcareo-punctate, rather broadly ovate to suborbicular, 3-5 (7) cm long and 1.5-2.5 (3) cm broad, commonly round-tipped, abruptly and slenderly cuspidate, rather abruptly narrowed into and usually much longer than the broad flat petiole; scapes solitary or rarely 2 or 3, erect, at base terete and fairly stout, compoundly panicked nearly from base or from the height of 4-6 cm, the branches strongly attenuated, angled or narrowly winged, commonly densely puberulous from base or sometimes glabrate; spikes 1.5-3 cm long and ca. 1 cm broad, rather loosely 7-13-spiculed, secund, imbricated-distichous, sessile or minutely pedunculate, gathered in a rather narrow or more or less spreading panicle inflorescence; spicules ca. 10 mm long, (2) 3-5-flowered; bracts 5 in 3-flowered spicules; outer bract ca. 8-9 mm long, mostly equaling or slightly shorter than the calyxes, rather densely puberulous or glabrate on both sides, irregularly and broadly ovate or suborbicular, rigidly herbaceous and very broadly scarious-margined, the herbaceous part
397 gradually attenuate into a stout occasionally bifid cusp 2-3 mm long; first inner bract slightly narrower and 9-10 mm long, more irregular in shape, the herbaceous part somewhat enlarged at apex and terminating in 3 (rarely 2) unequal cusps (the middle one 2-4 mm long and usually greatly surpassing the calyx) and broad more or less rounded-membranous lateral lobes; other inner bracts (one per flower) slightly shorter and narrower, scarious, with a narrow ciliate midrib, slenderly mucronate or muticous; calyx ca. 8-9 mm long, funnelform, the tube ca. 5-6 mm long and 1 mm in diameter; with broad herbaceous nerves, in lower one-half to two-thirds densely puberulous nearly throughout, upward merely on the nerves or sometimes glabrous; calyx limb ca. 3 mm broad, rather distinctly 10-lobed, the primary lobes fairly large and rounded, the intermediate lobes much smaller, the nerves hairy or bare, broader in lower part, reaching the middle of the limb or very slightly higher up; petals rose-violet. Fl. May-June; fr. June-July.

Stony alluvial deposits and gravelly soils, sometimes wastelands in foothills and low mountains. — Soviet Central Asia: Balkh. (area around the southern extremity of Lake Balkhash), T. Sh. (Chu-Ili Mts. and the adjacent part of the Trans-Ili Ala Tau, NE foothills of the Kirghiz Ala Tau to the W. part of the Issyk-Kyl' Depression, Karatau). Endemic. Described from the Chu-Ili Mountains. Type in Alma Ata.

Note. A characteristic, morphologically well defined species, apparently related, on the one hand, to *G. callicomum* (C.A.M.) Boiss., and on the other, to *G. speciosum* (L.) Boiss. Specimens from Karatau are not quite typical and it may prove necessary, upon collection of more ample material, to establish it as a separate geographical race, distinct from the Chu-Ili.

Subsection 2. *STENOCALYX* Lincz. subsect. n. in Addenda XVII, 746. — Calyx narrowly funnelform, with long, narrow, and more or less acute lobes. Subsection type: *G. tataricum* (L.) Boiss.

Series 1. *Tatarica* Lincz.—Spikes rather dense and short; scape branches fairly stout and broadly winged; leaves broad. Series type: *G. tataricum* (L.) Boiss.

9. *G. tataricum* (L.) Boiss. in DC. Prodr. XII (1848) 632, p.p. excl. β . *angustifolium* et γ . *laxiflorum* Boiss.; Boiss. Fl. or. IV (1879) 854, p.p. excl. β . *angustifolium* Boiss.; Kuzn. in Mat. Fl. Kavk. IV, 1, 199 (incl. f. *pumila* Kusn.); Fedch. O. and B. Perech. rast. Turk. V, 180, p.p. excl. var. *Bessermanum* O. et B. Fedtsch.; Grossg. Fl. Kav. ed. 1, Ill., 218; Chernova in Tr. prikl. bot. gen. i sel. X, 1, 147; Leisle in Fl. Yugo-Vost. VI, 36; Klok. in Vizn. rosl. URSS (1950) 705.—*G. tataricum* var. α . *typicum* et var. β . *puberulum* Trautv. in 398 Bull. Acad. Sc. Petersb. XIV (1856) 250, 251.—*Statice tatarica* L. Sp. pl. (1753) 275; M. B. Fl. taur.-cauc. I, 251; Ldb. Fl. Ross. III, 464.—*S. tatarica* var. α . *typica* Rgl. in Tr. Bot. Sada, VI, 2 (1880) 388, in append., p.p.; Shmal'g. Fl. II, 190.—*Limonium tataricum* Mill. Gard. Dict. ed. 8 (1768) No. 5.—Ic.: Gmel. Fl. sib. II, tab. 92; Rchb. IC. Fl. Germ. XVII, tab. 1139, 1200 (?); Bot. Mag. CVII, tab. 6537; Fedch. and Fler. Fl. Evrop. Rossii, Fig. 629; Gams in Hegi, Ill. Fl. V, 3, f. 2877; Chernova, l.c., Fig. 1, 2.—Exs.: Lang et Szov. Herb. ruth. No. 145; Callier, It. taur. 1900, No. 712 (sub *G. Bessermanum*); Novopokr. Gerb. Donsk. fl. No. 145.

Perennial, 10-40 cm tall; root commonly rather slender, caudex rather strongly thickened by a coat of leaf remnants, simple or with 2-4 short branches; leaves all radical, usually numerous, rather rigid, pale green, all glabrous, rather densely and minutely calcareo-punctate, broadly lanceolate or rarely lanceolate to oblong-obovate, (5) 10-15 (25) cm long and (1) 2-2.5 (3.5) cm broad, abruptly acuminate or almost round-tipped, with a cusp up to 5 mm long, gradually tapering into and about as long as the rather broad flat petiole; scapes commonly 1 or 2, rarely up to 4, erect, strongly angled below, in upper two-thirds or one-half compoundly dichotomously branched, the branches rather broadly winged, glabrous or rarely rather sparsely puberulous (sometimes from base or more often merely in the branched part); spikes fairly dense and mostly short, secund, dichotomous, terminal, gathered into a loose hemispherically corymbose inflorescence; spicules ca. 7-8 mm long, 2- or 3-flowered; outer and first inner bract subequal, mostly not exceeding or barely exceeding the calyx tube, glabrous or sparsely puberulous, rigidly herbaceous, rather narrowly scarious-margined, the outer bract unicuspidate, the first inner bract with 3 fairly long and stout cusps; calyx ca. 7-8 mm long, narrowly funnelform, the tube ca. 5 mm long and 1 mm in diameter, with rather broad herbaceous nerves, in lower half or two thirds or else entirely rather densely puberulous on the nerves or also between them; calyx limb ca. 2.5-3 mm broad, 5-lobed, the lobes large, narrowly rounded-triangular, obtusish 401 or acutish, the nerves strongly attenuated, not reaching beyond the middle of the lobes; petals violet-rose. Fl. June-July; fr. July (Plate XX, Figure 2).

Steppes, on chalky and stony slopes in plains and the lower mountain zone (Crimea and N. Caucasus), often in saline soils.—European part: M. D., V.-Don, Transv., Bl., Crim., L. Don, L. V.; Caucasus: Cisc., Dag., S. Transc. (near Leninakan, adventive?). Endemic (?). Described from "Tatariya". Type in London.



Plate XX

1. *Goniolimon speciosum* (L.) Boiss., 1a) calyx, 1b) ovary. 2. *G. tataricum* (L.) Boiss., inflorescence branch with two spicules. 3. *Cephalorrhizum oopodum* M. Pop. et Korov., part of inflorescence, 3a) inflorescence branch with two spicules, 3b) ovary. 4. *C. turcomanicum* M. Pop., 4a) calyx, 4b) stamens, with filaments coherent at base.

Note. A distinct form, *G. caucasicum* Klok. in Grossg. Oprod. rast. Kavk. (1949) 593. (= *G. tataricum* var. *puberulum* auct. in herb. p.p. non Trautv. l.c.), distinguishable by leaves, which are densely pubescent over the whole surface and the scapes rather densely pubescent throughout. The rather pronounced pubescence of the scapes occurs also in specimens of *G. tataricum* from various parts of its distribution area (e.g., from the Rostov, Voronezh, and the Lower Dnieper areas), while identical specimens were at one time reported as var. *puberulum* Trautv., l.c. Thus, it is necessary to revise the prevalent, though wrong, idea that *G. tataricum* is always quite glabrous (except for the calyx tube), as there is hardly any point in distinguishing its glabrous and pubescent forms in the absence of distinct distribution areas. The only exception is apparently the geographically isolated *G. caucasicum* Klok., with its pubescent leaves that are not to be found in other forms. *G. tataricum* has been repeatedly reported for Rumania, Bulgaria and Hungary; but, in the absence of satisfactory herbarium material, we have been unable to obtain full confirmation of these reports and it is possible that they refer to related critical species. It appears (on the basis of material available in the herbarium of the Botanical Institute of the Academy of Sciences of the USSR) that *G. tataricum* does not occur in the Moldavian SSR.

Series 2. **Rubella** Lincz. — Spikes rather loose and long; inflorescence branches slender, narrowly winged and finely angled; leaves narrow. Series type: *G. rubellum* (S.G. Gmel.) Klok.

10. **G. rubellum** (S.G. Gmel.) Klok. in Grossg. Oprod. rast. Kavk. (1949) 593 and in Vizn. rosl. URSS (1950) 705. — *G. tataricum* β . *angustifolium* Boiss. in DC. Prodr. XII (1848) 633 et Fl. or. IV (1879) 854, p.p. quoad syn. Gmel. et M.B. — *G. tataricum* var. γ . *rubellum* Trautv. in Bull. Acad. Sc. Petersb. XIV (1856) 251. — *G. tataricum* ssp. *Besserianum* Nym. Consp. fl. Europ. III (1881) 613, p.p. quoad syn. Beck. — *G. Besserianum* Kusn. in Mat. Fl. Kavk. IV, 1 (1902) 202, p.p. quoad syn. Gmel. et M.B.; Fedch. and Fler. Fl. Evrop. Rossii, 743; p.p.; Grossg. Fl. Kavk. ed. 1, III, 218; Leisle in Fl. Yugo-Vost. VI, 37. — *G. tataricum* var. *Besserianum* O. et B. Fedtsch. Perech. 402 rast. Turk. V (1913) 180, p.p. — *G. orae-syvashicae* Klok. in Idn. sem. horti Charkov (1927) 8 and in Vizn. rosl. URSS (1950) 705. — *Statice rubella* S.G. Gmel. Reise, II (1774) 199. — *S. tatarica* var. α . *typica* Rgl. in Tr. Bot. Sada, VI, 2 (1880) 388, in append. p. min. p. quoad syn. Gmel. — *S. tatarica* β . *Besseriana* Schmalh. Fl. II (1897) 190, p.p. — *S. incana* M.B. Fl. taur.-cauc. I (1808) 251, non L.; Ldb. Fl. Ross. III, 464. — Ic.: S.G. Gmel. l.c. tab. 34.

Perennial, 10-25 cm tall; root slender; caudex rather strongly thickened by a coat of leaf remnants, simple or shortly 2-4-parted; leaves all radical, fairly numerous, rather rigid, glaucous-green, becoming reddish, rather densely pubescent and minutely calcareo-punctate over the whole surface, oblong to sublinear or elliptical-lanceolate, occasionally oblong-obovate, (3) 6-8 (10) cm long and 0.5-1 cm broad, gradually or rather abruptly acuminate, slenderly mucronate, mostly tapering very gradually into and about as long as the narrow flat petiole; scapes commonly 1 or 2, rarely

up to 4 or 5, erect, subterete and densely pubescent at base, in upper three-quarters or two-thirds compoundly dichotomously branched, the branches slender, narrowly winged or angled, irregularly pubescent to glabrate; spikes commonly loose and long, indistinctly secund, distichous, terminal, gathered in a loose hemispherically corymbose inflorescence; spicules ca. 7-8 mm long, 1- or 2-flowered; bracts nearly always glabrous; outer bract usually slightly shorter than the first inner bract and this nearly always markedly shorter than the calyx tube, both rigidly herbaceous, rather broadly scarious-margined, the outer bract unicuspidate, the first inner bract with 3 fairly long and stout cusps; calyx ca. 7-8 mm long, narrowly funnelform, the tube ca. 4.5-5 mm long and 1 mm in diameter, with fairly broad herbaceous nerves, rather densely hairy throughout except toward apex where pubescence is confined to the nerves; calyx limb 2.5-3.5 mm broad, 5-lobed, the lobes large, narrowly triangular, acutish, the nerves abruptly attenuated and usually not reaching beyond the middle of the lobe; petals violet-rose. Fl. May-June; fr. June.

Grass and wormwood associations, chiefly in the semidesert zone. — European part: Transv. (S. part), Bl. (Sivash River area), Crim. (N. lowland part), L. Don (E. part), L. V.; W. Siberia: U. Tob. (Extreme W.); Soviet Central Asia: Ar.-Casp. (extreme NW). Endemic. Described from the Astrakhan area. Type in London.

Note. This species differs from *G. Bessarianum*, with which it has often been confused, in the always pubescent calyx, leaves, and scapes.

- 03 11. *G. Bessarianum* (Schult.) Kusn. in Mat. Fl. Kavk. IV, 1 (1902) 202, p.p. excl. syn. nonn.; Fedch. and Fler. Fl. Evrop. Rossii, 743, p.p.; Klok. in Vozn. rosl. URSR, 706. — *G. tataricum* β . *angustifolium* Boiss. in DC. Prodr. XII (1848) 633 et Fl. or. IV (1879) 854, p.p. quoad syn. Roem. et Schult. — *G. tataricum* var. δ . *Bessarianum* Trautv. in Bull. Acad. Sc. Petersb. XIV (1856) 251. — *G. tataricum* ssp. *Bessarianum* Nym. Consp. fl. Eur. III (1881) 613, p.p. excl. syn. — *Statice Bessariana* Schult. Syst. veg. VI (1820) 789, in observ.; Ldb. Fl. Ross. III, 463. — *S. tatarica* var. *angustifolia* M.B. Fl. taur.-cauc. III (1819) 253. — *S. tatarica* var. β . *Bessariana* Rgl. in Tr. Bot. Sada, VI, 2 (1880) 388, in append.; Shmal'g. Fl. II, 190, p.p. — *Limonium Bessarianum* Ktze. Rev. gen. II (1891) 395. — Ic.: Rchb. Pl. crit. VIII (1830) tab. 720. — Exs.: Lang et Szov. Herb. ruth. No. 86.

Perennial, 10-25 (40) cm tall; roots commonly rather slender; caudex rather strongly thickened by a coat of leaf remnants, simple or 2-4-parted; leaves all radical, usually numerous, rather stiff, pale green, all glabrous, rather densely and minutely calcareo-punctate, oblong-lanceolate or rarely oblong-obovate or linear, (4) 6-8 (12) cm long and (0.5) 0.8-1.5 (1.8) cm broad, rather abruptly acuminate or almost round-tipped, very gradually tapering into and usually about as long as the rather narrow flat petiole; scapes commonly 2 or 3, rarely up to 6, erect, subterete below, in upper three-quarters or two-thirds compoundly dichotomous, the branches narrowly winged or angled, all glabrous; spikes rather loose, often fairly long, distinctly secund-distichous, terminal, gathered in a loose hemispherical-corymbose inflorescence; petioles ca. 7-8 mm long, 1- or 2-flowered; bracts glabrous; outer bract usually somewhat shorter than the first inner bract, this equaling or slightly exceeding the calyx tube, both rigidly herbaceous, rather narrowly scarious-margined, the outer

bract unicuspidate, the first inner bract with 3 fairly long and stout cusps; calyx ca. 7-8 mm long, narrowly funnelform, the tube ca. 4.5-5 mm long and 1 mm in diameter, with rather broad herbaceous nerves, both tube and limb glabrous; calyx limb ca. 2.5-3 mm broad, 5-lobed, the lobes large, narrowly triangular, acute, the nerves abruptly attenuated, not reaching beyond the middle of the lobe; petals violet-rose (or violet-red, to purple?). Fl. June-July; fr. July.

404 Steppes, on fine-earth, chalky, and stony slopes; sometimes in saline soils.—European part: M D. (SW part), Bes., Bl. (W. part).

Endemic. Described from Podolia, the Kherson area, and Odessa. Type in Leipzig (?).

Note. 1) Differing markedly from *G. tataricum* (L.) Boiss. in narrower small leaves, more slender and narrowly winged inflorescence branches, and the complete lack of pubescence (also on calyx). The latter characteristic is particularly constant and provides a means of reliable identification of *G. Bessarianum*. I know of only a single specimen of *G. tataricum*, out of a large number examined, with a glabrous calyx (Voronezh Region, chalk outcrops, 10 June 1903, V.A. Dubyanskii), marked in herbarium by M.V. Klovov as *G. tataricum* f. *pseudo-Bessarianum* Klok.

2) Various authors also identified with *G. Bessarianum* the relatively narrow-leaves forms of *G. tataricum* and they often confused this species with *G. rubellum*. The right position of *G. Bessarianum*, in conformity with priority rules, was only recently established by M.V. Klovov (l.c., 1950). It should be pointed out that none of the earlier authors took notice of the fact that Nyman (l.c.), when placing *Statice Bessariana* in the genus *Goniolimon*, had accepted it as a subspecies, and hence there is the justification for the recurrent practice of ascribing to Nyman the authorship of the combination at the species level (i.e., "*G. Bessarianum* Nym."). The authorship of this combination belongs rightfully to N.I. Kuznetsov (l.c.), who was in fact the first to publish it.

12. ***G. graminifolium*** (Ait.) Boiss. in DC. Prodr. XII (1848) 633 et Fl. or. IV (1879) 854; Kuzn. in Mat. Fl. Kavk. IV, 1, 206; Fedch. and fler. Fl. Evrop. Rossii, 743; Klok. in Vizn. rosl. URSR, 706.—*G. tataricum* γ. *laxiflorum* Boiss. in DC. Prodr. XII (1848) 633.—*G. tataricum* ε. *desertorum* et var. ζ. *graminifolium* Trautv. in Bull. Acad. Sc. Petersb. XIV (1856) 251, 252.—*G. desertorum* Klok. in Ind. sem. Hort. Charkov. (1927) 8 and in Vizn. rosl. URSR, 706.—*Statice graminifolia* Ait. Hort. Kew. I (1789) 383; Trautv. Russk. Fl. I (1844) 22; Ldb. Fl. Ross. III, 463; Shmal'g. Fl. II, 190.—*S. graminifolia* var. α. *typica* et var. β. *desertorum* Rgl. in Tr. Bot. Sada, VI, 2 (1880) 388, in append.—*S. desertorum* Trautv. Russk. Fl. I (1844) 26; Ldb. l.c. 463.—*Limonium graminifolium* Ktze. Rev. gen. II (1891) 395.—*L. desertorum* Ktze. l.c. 395.—Ic.: Rchb. Pl. crit. VIII, tab. 721; Trautv. l.c. Plate 9, 11.—Exs.: GRF, No. 130.

Perennial, 20-50 cm tall; roots slender; caudex rather strongly thickened by a coat of leaf remnants, simple or 2-4-parted; leaves all radical, fairly numerous, rather rigid, glaucous-green, glabrous or more or less densely pubescent, nearly always finely ciliolate-margined, narrowly linear to narrowly lanceolate, (6) 10-12 (18) cm long and (0.1) 0.2-0.4 (0.7) cm broad, acuminate, very gradually tapering at base into

405 a long and narrow petiole; scapes commonly 1 or 2, erect, subterete below, in upper one-half to two-thirds compoundly dichotomous, the branches slender, angled or very narrowly angled, glabrous or irregularly puberulous; spikes commonly loose and long, indistinctly secund-distichous, terminal, gathered in a very loose hemispherical-corymbose inflorescence; spicules ca. 8-10 mm long, 1- or 2-flowered; bracts glabrous or very slightly pubescent; outer bract about a third to half as long as the first inner bract, this usually markedly shorter than the calyx, both bracts rigidly herbaceous and broadly scarious-margined, the outer bract unicuspidate, the first inner bract with three rather short stout cusps; calyx ca. 8-9 mm long, narrowly funnelform the tube 4-4.5 mm long and 1 mm in diameter, with rather broad herbaceous nerves, rather densely pubescent throughout except toward apex where pubescence confined to the nerves; calyx limb ca. 3.5-4.5 mm broad, 5-lobed, the lobes large, narrowly triangular, acutish, the abruptly attenuated nerves not reaching as a rule beyond the middle of the lobe; petals violet-rose (or violet?). Fl. June-July; fr. July.

Sands on old river terraces and sand- and stone-covered slopes. — European part: Bl. (the area of the lower courses of the Dnieper and Bug), ? L. V. (old reports, needing confirmation). Endemic. Described from cultivated specimens, grown in Kew Botanical Gardens. Type in London (in the British Museum).

Note. A broad-leaved form (with leaves 0.5-0.7 cm broad) was described in 1844 as *Statice desertorum* Trautv. (l.c.), and was later reported as *Goniolimon desertorum* (Trautv.) Klok. (l.c.). In our opinion, there are no grounds for setting up this form as a distinct species, since the characteristic of pubescence, already noted by Ledebour (l.c.), is not an absolute one: pubescent as well as glabrous leaves occur in both the narrow-leaved and the broad-leaved form, while there seem to be no other distinguishing characteristics. There is also hardly any justification for accepting the assertion of N.I. Kuznetsov (l.c., 204, 205) that the broad-leaved form is a hybrid (*G. graminifolium* × *G. tataricum*). It seems more to the point to assume that variations of leaf breadth occur within the natural distribution area of this species. It should be noted that Trautvetter himself, who had described this form as a species, awarded it twelve years later (in 1856) merely the position of a variety of *G. tataricum*.

Genus 1139. **CEPHALORRHIZUM** * M. POP. ET KOROV.

M. Pop. and Korov, in Tr. Turk. nauchn. obshch, I (1923) 39 ("Cephalorrhizum").

406 Calyx subtubular (with a narrowly campanulate limb) or funnelform, the tube rigidly herbaceous, the limb 5- or 10-lobed, scarious, straight at base, the 5 nerves pubescent within or bare; corolla but slightly exceeding the calyx; petals distinct except at base where cyathiformly shortly coherent, slightly recurved at the tips, forming a tube in lower part by overlapping of margins, after anthesis incurved; filaments of bare stamens, distinct except at base where strongly dilated, cyathiformly connate and

* From Greek *cephale* = head, and *rhiza* = root.

adnate to petals; styles distinct from base, bare; stigmas hemispherically depressed-capitate; ovary oblong-linear to oblong-ovoid, rather strongly angled, not attenuated or only slightly so, the transition between the ovary and style quite distinct; petals oblong-linear, not enlarged at the top, dehiscent with valves (without a lid). Perennials with a woody caudex; leaves broad, rigidly fleshy, in radical rosettes; spicules 1-4-flowered, borne on the terminal branchlets of compoundly or simply panicked scapes.

The genus is known to contain two species, distributed through Soviet Central Asia, in SW Pamir-Alai, and E. Kopet Dagh.

1. Spicules all single-flowered; scapes compoundly panicked. 1. **C. oopodum** M. Pop. et Korov.
- + Spicules 2- or 3- (4)-flowered; scapes simply panicked. 2. **C. turcomanicum** M. Pop.

1. **C. oopodum** M. Pop. et Korov. in Tr. Turk. nauchn. obshch. I (1923) 39; Lincz. in Tr. Tadzh. bazy AN SSSR, VIII (1940) 586 (in observ.). - Ic.: M. Pop. et Korov. l.c. tab. 5.

Perennial, 40-60 cm tall; root stout; caudex ovoidly or spherically thickened by a dense coat of leaf remnants, up to 5 cm in diameter; leaves all in a radical rosette, fairly numerous, rigidly fleshy, greenish-glaucous or glaucous, lance-spatulate, 5-15 cm long, rounded-hastate or broadly lanceolate, acuminate, up to 1.5-2.5 cm broad, tapering into a long broad flat petiole (usually half as long again to twice as long as the blade), densely calcareo-punctate throughout, minutely ciliate-scabrous on the margin (more densely so on the petiole); scapes commonly 2-4, erect, stout, firm, in upper one-third to one-half compoundly panicked, the branches strongly attenuated, slightly angled, brittle (especially at the top), with small broadly short-triangular membrano-herbaceous scales at the base of nodes, rather densely calcareo-punctate and slightly scabrous, glabrous below, 407 in panicked part rather densely hirsutulous; spikes terminal, rather loosely 5-15-spiculed, sometimes secund, 2-4 cm long; spicules 8-10 mm long, all single-flowered; bracts 3, all densely hirsutulous, rigidly herbaceous, with a rather broad undulate glaucescent-membranous margin, covering the calyx to two-thirds its length; outer bract ca. 3 mm long, broadly triangular-ovate; first inner bracts slightly longer, subinvolute; second inner bract slightly longer than the first, tubularly involute and tightly enclosing the calyx; both inner bracts obliquely truncate at apex, with a fairly broad single-sided limb; calyx 7-8.5 mm long and ca. 1.5 mm in diameter, subtubular, the limb narrowly campanulate, glaucescent becoming whitish, the tube faintly ribbed, rigidly herbaceous nearly up to the limb, densely puberulous throughout on the outside, the nerves very broadly herbaceous, interconnected; calyx limb scarious, parted to 1.5-2 mm into 5 lanceolate or oblong-ovate acutish primary lobes, with broad nerves densely covered inside with rather long hairs and terminating about 1 mm short of the margin, and 5 intermediate nerveless lobes of same length or somewhat shorter, sometimes slightly broader, obtusish; petals reddish-violet, subtruncate and shallowly and broadly emarginate. Fl. May-July; fr. June-July (Plate XX, Figures 3, 3a, 3b).

Red sandstone and gypsiferous clay outcrops in low mountains, at altitudes of 700-1200 m. - Soviet Central Asia: Pam.-Al. (Ranges of southern Tadzhikistan from Kulyab to Bata-tag). **Gen. distr.:** ? N.

Afghanistan. Described from the N. part of the Baba-tag Range near the village of Kel'bulak. Type in Tashkent; isotype in Leningrad.

2. **C. turcomanicum** M. Pop. sp. n. in Addenda XVII, 746.

Perennial, 35-45 cm tall; root stout; caudex ovoidally or spherically thickened by a dense coat of leaf remnants, up to 5 cm in diameter; leaves all in a radical rosette, fairly numerous, rigidly fleshy, glaucous or greenish-glaucous, oblong-spaculate, 4-7 cm long, the blade broadly rounded-spatulate, rarely rounded-hastate, obtusely round-tipped or very slightly pointed, finely short-cuspidate, up to 2-3 cm broad, very gradually tapering at base into a broad flat petiole, densely calcareo-punctate throughout, the margin densely and minutely ciliate-scabrous; scapes 2
408 or 3, erect, stout, firm, in upper half simply paniced, the branches numerous, slender and short, multiarticulate, brittle (especially at the top), with fairly large triangular or triangular-ovate rather long-acuminate membrano-herbaceous scales at the base of nodes, sparsely calcareo-punctate, nearly smooth, lustrous; spikes terminal, densely 3-6-spiculed, subspherical or somewhat oblong, ca. 1.5-2 cm long; spicules ca. 1 cm long and 15 cm [? mm] broad, 2- or 3- (4)-flowered; bracts 5 in 3-flowered spicules, all glabrous; outer bract ca. 8-10 mm long and broad, markedly shorter than the inner bract, irregularly rounded-cordate, in the medial rigidly herbaceous part ovate, with a short very slightly produced cusp, abruptly passing into a very broad (up to 3-4 mm) undulate white-membranous margin; first two inner bracts closely resembling the outer bract but markedly larger, nearly concealing the calyx, with a narrower and more gradually attenuated herbaceous part; other inner bracts much shorter and smaller, scarious, the narrow midrib terminating below the margin; calyx 8-10 mm long, funnelform, glabrous throughout, the tube with 5 prominent rounded ribs, rigidly herbaceous, scarcely thinner at the ribs, the nerves very broad, flat, interconnected; calyx limb ca. 2.5-3 mm broad, white, obsoletely 5-lobed, the nerves broad and thick, obtusely acuminate, abruptly terminating well below the middle of the limb; petals violet-red, shallowly emarginate. Fl. June; fr. July (Plate XX, Figures 4, 4a, 4b).

Stony taluses and rocks. — Soviet Central Asia: Mtn. Turkm. (Kopet Dagh Range east of Gaudan, in the area of the village of Shamli and the Shorlok Valley). **Gen. distr.:** ? Iran. Described from the location indicated. Type in Leningrad.

Genus 1140. **ARMERIA** * WILLD. **

Willd. Enum. pl. Hort. berol. (1809) 333, nom. conserv. — Statice L. Sp. pl. (1753) 274, partim, emend. Mill. Gard. Dict. Abridg. ed. 4 (1754). — Statice sect. Armeria DC. Fl. fr. III (1805) 419.

Calyx funnelform, the tube herbaceous, scarious semitranslucent plaited limb, the 5 lobes broadly triangular; petals 5, oblong-obovate, obtuse, tapering at base into the petiole, distinct or coherent merely at base; stamens 5, opposite the petals and attached at their base; styles hairy in

* From Celtic ar = near, and mer = sea, in allusion to the plant's habitat.

** Prepared by E.I. Shteinberg.

409 lower third, rarely bare; stigmas cylindrically filiform; fruit single-seeded, thinly membranous, rupturing in lower part; flowers borne on pedicels 0.5-1 mm long, in bracted clusters of 1-3, forming a close capitate inflorescence at the end of the scape; inflorescence subtended by an involucre of 5 or 6 scarious bracts, these elongated at base and united into a tubular sheath, the sheath cleft on the side in lower part, clasping the upper part of the scape; leaves radical, numerous, linear.

The genus *Armeria* contains 50 species distributed through the northern temperate zone and in South America along the Chilean Andies down to Tierra del Fuego, both in plains and in mountainous areas. Three species occur in the USSR.

Economic importance. Species of *Armeria* are grown in gardens as ornamentals. According to Hegi, seaside forms of thrift contain iodine.

- 1. Outer involucral bracts subulately pointed, often overtopping the flower head; leaves glabrous except for the ciliate margin and sometimes eciliate. 2. ***A. elongata*** (Hoffm.) C. Koch.
- + Outer involucral bracts obtuse, ovate-oblong, shorter than the flower head; leaves eciliate. 2.
- 2. Calyx tube hairy on the ribs and between them. . . 1. ***A. sibirica*** Turcz.
- + Calyx hairy only on the primary and subsidiary nerves. 3. ***A. arctica*** (Cham.) Wallr.

Section 1. **PLAGIOBASIS** Boiss. in DC. Prodr. XII (1848) 677.—Calyx obliquely attached to pedicel, its base more or less obliquely truncate.

Subsection 1. **HOLOTRICHAE** Boiss. in DC. 1.c.—Calyx tube pilose throughout, on and between the nerves.

1. ***A. sibirica*** Turcz. ex Boiss. in DC. Prodr. XII (1848) 678; Ldb. Fl. Ross. III, 1, 457; Turcz. in Bull. Soc. Nat. Mosc. XXV, 3, 399 et Fl. baic.-dah. No. 930; Fedch. and Fler. Fl. Evrop. Rossii, 744.—*A. maritima* var. *sibirica* Lawrence in Gent. herb. IV, f. XI (1940) 405.—*Statice maritima* var. *sibirica* Simmons in Second Norw. Arctic Exped. Fram. (1906) 34.—*S. Armeria* var. *sibirica* Ostenf. et Lund in Meddel. om Gronl. XIV (1910) 30.—Ic.: Fl. dan. XVI, f. 2769.

410 Perennial, glabrous; taproot vertical, bearing at the top a large number of short erect stemlike shoots tightly clothed in remnants of leaf petioles; leaves narrowly linear, flat, glabrous, subobtuse, with a single median vein; inflorescence a compact head ca. 15 mm across, borne on a somewhat thickened glabrous scape; involucral bracts obovate to orbicular, reddish-brown, scarious; calyx 5-6 mm long, the scarious plaited limb equalling the calyx tube, with triangular lobes and very short sharp teeth on the margin; calyx tube and ribs pilose throughout. July-August.

Swampy meadows with gritty soil, in the alpine zone.—E. Siberia: Ang.-Say. **Gen. distr.:** Mong. Described from a lakeshore near Tesinskii outpost in the Minusinsk area (the specimens apparently collected by Ilya Kuznetsov for Turchaninov). Type in Leningrad.

Subsection 2. **PLEUOTRICHAE** Boiss. in DC. Prodr. XII (1848) 679.—Calyx tube pilose on the ribs and bare between them.

2. **A. elongata** (Hoffm.) C. Koch in Flora, VI (1823) 698; Boiss. in DC. Prodr. XII (1848) 681.—*A. vulgaris* Willd. *β. elongata* Mert. et Koch in Roehlings Deutschl. Fl. II (1826) 487.—*A. maritima* var. *elongata* Massart ex Lawrence in Gentes Herb. IV, XI (1940) 406.—*Statice elongata* Hoffm. Deutschl. Fl. ed. 3, I (1800) 151.—*Statice Armeria β. elongata* DC. in Fl. Franc. III (1805) 419; Shmal'g. Fl. II, 193; Fedch. and Fler. Fl. Evrop. Rossii. 744.—Ic.: Fl. danica, XV, 2585.—Exs.: GRF, No. 129; Fl. pol. exs. No. 681; Fl. Hungar. exs. No. 686; Fl. ital. exs. No. 622; Fl. silesiaca exs. No. 1145; Fl. exs. Reipubl. Bohem.-Sloven. No. 454.

Perennial; taproot long, fusiform, branched, dark brown, many-headed; leaves up to 8 cm long, herbaceous, narrowly linear, 1.5-2 mm broad, single-nerved, glabrous, except the finely ciliate margin, more or less pointed; scapes 20-30 cm long, twice the length of leaves, glabrous; flower head 15-20 mm across; involucre bracts 10-14, pale brown like the inner bracts; outer involucre bracts gradually subulate-pointed from a broadly obovate base, often exceeding the flower head (the subulate point clearly visible on young undeveloped heads); inner involucre bracts obtuse, minutely and sharply denticulate on the broad margin; head consisting of 3- or 4-flowered racemose clusters, each cluster surrounded by a very obtuse obovate bract, this with a broad silvery-hyaline margin, inserted opposite the lowest flower; other bracts laterally attached to the cluster, gradually attenuated further up; pedicels equaling the calyx tube; calyx tube with 10 pilose lines and 5 subulate teeth jointed at the margin by a whitish translucent film; petals lilac, rarely pure white, obovate, obtuse. June-August (Plate XXI, Figure 2).

Sand dunes, sandy pastures, and coastal meadows.—European part:
 411 Lad.-Ilm., Balt., U. Dns., U. Dnp. **Gen. distr.:** Scand., Centr. and Atl. Eur., W. Med., N. Am. Described from W. Europe. Type in Berlin.

3. **A. arctica** (Cham.) Wallr. Beitr. II (1844) 193; Rupr. Fl. Samoied. cisural., 51; Boiss. in DC. Prodr. XII, 679; Kryl. Fl. Zap. Sib. IX, 2165.—*A. vulgaris arctica* Cham. in Linnaea, 6 (1830) 566.—*A. vulgaris* var. *arctica* Ldb. ex Fedch. and Fler. Fl. Evrop. Rossii (1910) 744.—*Statice Armeria β. arctica* Ldb. Fl. Ross. III (1848) 457.—*Statice maritima* subsp. *arctica* (Cham.) Hulten, Fl. of Alaska and Yukon, VIII (1848) 1295.—? *Statice maritima* subsp. *labradorica* (Wallr.) Hult. l. c. 1296.

Perennial, glabrous; taproot vertical, with very many slender subsidiary roots, many-headed, dark brown; leaves crowded at the ends of shoots, flat, sometimes conduplicate, narrowly linear, 2-8 cm long, 0.5-1.5 mm broad, glabrous or with few cilia in lower part, attenuated toward apex; scapes 5-20 cm long, glabrous or slightly pubescent; flower head spherical, 1-2 cm across; involucre bracts scarious, ovate, obtuse or obtusely short-pointed, mostly pale brown; pedicels 0.5-2 mm long; bracts as long as the flowers, scarious, broadly obovate, slightly and bluntly dentate, usually tinged with violet-purple or violet-rose, sometimes rufescent at the margin; calyx ca. 6 mm long, the tube pilose on the nerves, the limb whitish-scarious, with a brownish nerve opposite each lobe; corolla violet-rose, about equaling the calyx. July-August (Plate XXI, Figures 1a, 1b, 1c).

In the polar-arctic zone, more rarely in the alpine and adjoining parts of the forest zone, in dry and lichen tundras, fescue and dryad subalpine tundras, sandy coastal slopes and sometimes stony slopes. — Arctic: Arc. Eur., Nov. Z., Arc. Sib., Chuk., Anad.; Far. East: Kamch., Okh., Sakh. **Gen. distr.:** Scand., Ber., N. Am. Described from Unalaska and the shores of Shishmaref Inlet. Type in Leningrad.

Note. The specimen collected in the Kola Peninsula on the banks of the Varzuga River near the village of Kuzomen, by O. I. Kuznetsov and L. R. Ponomareva, resembles closely *A. arctica* Wallr., but is devoid of pubescence on the shoots and calyx ribs.

Genus 1141. **LIMONIUM** * MILL.

Mill. Gard. Dict. Abridg. ed. 4 (1754), nom. conserv. — *Statice* L. Sp. pl. (1753) 274, partim. emend. Willd. Enum. pl. Hort. Berol. (1809) 335.

Calyx funnelform, obconical, or tubular, more or less scarious, straight or more or less oblique at base, the 5 rather narrow herbaceous nerves, 412 bare inside; calyx limb more or less pronounced, 5- or 10-lobed; corolla slightly exceeding to half as long again as the calyx; petals distinct except at base where united into a ring, more or less recurved at the tips, involute after anthesis; filaments of stamens distinct, at the very base adnate to petals; styles distinct from base, bare; stigmas cylindrically filiform; ovary obovoid to sublinear, broader at the top, the transition between ovary and style distinct; fruit more or less clearly obovoid (enlarged at the top), opening with valves (without a lid) or rarely (section *Pteroclados* Boiss.) also with a small lid. Perennials, often with a more or less woody caudex and rather large and broad, nearly always radical leaves; rarely subshrubs with ligneous leafy branches; flowers commonly small, rose, purple, violet, or yellow in one- to many-flowered spicules; spikes loose or dense, borne at the end of terminal, angled or more or less winged branches of commonly compoundly paniced scapes.

The genus contains about 300 known species, distributed through all parts of the world, though chiefly in Eurasia, and growing mainly in the plains, mostly in saline soils. About 35 specimens occur in the USSR.

Economic importance. Several species of the genus *Limonium* Mill. have long been used for tanning and dying, on account of the high content of tannins, especially in the roots. A rather large number of investigations has been conducted on these substances and their use in connection with *Limonium* species, but the results, particularly as regards the content of tannic substances, have been very contradictory. Some of the more recent and comprehensive studies by specialized botanists (L. I. Kazakevich, Kermeki Nizhnego Povolzh'ya [Sea-Lavenders of the Lower Volga Region], Zhurn. opyt. agron. Yugo-Vost. [Journal of Experimental Agronomy in the Southeast] VII, 1 (1929); N. M. Chernova, Kermeki Kryma [Sea-Lavenders of the Crimea], Tr. prikl. bot., gen. i sel., ser. X, 1 (1933); N. V. Pavlov, Dikie poleznye i tekhnicheskie rasteniya SSSR [Useful and Technological Wild Plants of the USSR] (1942); A. A. Grossgeim, Rastitel'nye resurvy

* From Greek *leimon* = meadow, meadow plant. The generic name *Limonium* Mill. was approved by the 6th International Botanical Congress in 1935, to replace the name *Statice* L. the use of which involved taxonomic confusion.

Kavkaza [Plant Resources of the Caucasus] (1946); N.V. Pavlov, Rastitel'noe syr'e Kazakhstana [Vegetable Raw Materials of Kazakhstan] (1947); M.S. Shalyt, Dikorastushchie poleznye rasteniya Turkmenskoi SSR [Useful Wild-Growing Plants of the Turkmen SSR (1951)], provide the following data (see Table) concerning the tannin content of the more important Limonium species in the USSR flora (the selection taking into account both the actual and potential value).

The tabulated data also show certain discrepancies. This can be noted in particular in the tannin content values for *L. caspium* and *L. otolepis*.

413

Species	Plant part	Tannin content (% dry matter)	Source
<i>L. caspium</i> (Willd.) Gams	root	6,65	Kazakevich, 1929
		6,2	Chemova, 1933
		9,5-16,07	Grossgeim, 1946
<i>L. Gmelinii</i> (Willd.) Ktze.	root	5-16,78	Kazakevich, 1929
		6-17	Pavlov, 1942
		10-25	Pavlov, 1947
		(averaging 17-18)	
<i>L. latifolium</i> (Sm.) Ktze.	root	19,29	Kazakevich, 1929
		9-25	Chemova, 1933
		12-25	Pavlov, 1942
		16,5-25	Grossgeim, 1946
		16,5-25	Pavlov, 1947
<i>L. Meyeri</i> (Boiss.) Ktze.	root	6,17-18,07	Grossgeim, 1946
		(averaging 13-16)	
		14,1	Shalyt, 1951 (as <i>Statice Gmelini</i> var. <i>grandis</i>)
<i>L. myrianthum</i> (Schrenk) Ktze.	root	17-19	Pavlov, 1947
<i>L. otolepis</i> (Schrenk) Ktze.	root	18-21	Pavlov, 1947
		6,2	Shalyt, 1951
<i>L. sareptanum</i> (Becker) Ktze.	root	5,42-8,73	Kazakevich, 1929
		9,5-16,07	Chemova, 1933
<i>L. suffruticosum</i> (L.) Ktze.	whole plant	3-6	Chemova, 1933
<i>L. tomentellum</i> (Boiss.) Ktze.	root	14,7-18	Chemova, 1933 (as <i>Statice Tshurjukiensis</i> Klok.)

The reason for such a lack of agreement (apart from purely technical errors which seem very likely, as, for instance, in the case of the 9.5-16.07% tannins reported by Grossgeim for *L. caspium*, while the same figures are given by Chernova for *K. sareptanum*), may be sought in differences in the time of sampling — a factor which is liable to be of great importance — and different analytical procedures. As far as the older

analytical data are concerned (and they are often used at the present time), wrong determination of species is also possible. In order to obtain fully reliable information concerning the tannin content of sea-lavenders, it is clearly necessary to carry out new studies, using a uniform analytical method and material collected at fixed times. Nearly all the authors now agree that the tannin content of sea-lavender roots is at its highest in spring and at the beginning of summer (April to June), and this is the time recommended for extraction; in fall the tannin content falls steeply.

- 414 On the basis of available analytical data and practical experience, the following species may be considered as most valuable tannin producers; 1) *L. Gmelinii* (Willd.) Ktze. — the tannin content is apparently high in all geographical races, including *L. tomontellum* (Boiss.) Ktze. and *L. Meyeri* (Boiss.) Ktze.; 2) *L. latifolium* (Sm.) Ktze. — the tannin content is somewhat higher than the preceding species, but distribution and available supply are much more restricted; 3) *L. myrianthum* (Schrenk) Ktze. and *L. otoplepis* (Schrenk) Ktze. — tannin content high, supply considerable (in Kazakhstan and Soviet Central Asia); 4) *L. sareptanum* (Becker) Ktze. — data concerning tannin content somewhat conflicting, but a species with rather wide distribution and likely to be of practical value. *L. caspium* (Willd.) Gams is apparently without practical importance, because of the small size of roots. *L. suffruticosum* (L.) Ktze., in view of the very low (3-6%) tannin content (though so far studied only on material from the Crimea and the Volga region, is, according to N. M. Chernova (ibid.) only of interest for selection of forms with a higher tannin content and subsequent introduction into cultivation, which might be promising in view of the extremely modest requirements of this species and its capacity for growing on highly saline soils (including puffy solonchaks). If, however, sea-lavenders are to be seriously considered as a staple source of tannins, attention must clearly be paid to the introduction into cultivation of other species, more particularly those endowed with high salt resistance. The forage value of sea-lavenders is very low; according to Larin (Kormovye rasteniya estestvennykh senokosov i pastbishch SSSR [Forage Plants of Natural Hayfields and Pastures of the USSR] (1937) 703-705), some of the species are not eaten at all, while few are eaten readily by sheep and camels (and that as a rule only in winter or as admixture to hay). Several species have been found to contain alkaloids.

Some *Limonium* species are used as ornamentals. Among these, one should mention *L. latifolium* (Sm.) Ktze. and *L. sinuatum* (L.) Mill. However, many other species growing in the USSR can be recommended for cultivation as decorative plants, such as the impressive yellow-flowered *L. aureum* (L.) Hill and *L. chrysocomum* (Kar. et Kir.) Ktze., the blue-flowered *L. Hoeltzeri* (Rgl.) Ik.-Gal. and *L. kaschgari-cum* (Rupr.) Ik.-Gal., species with striking appearance, such as *L. otoplepis* (Schrenk) Ktze., etc.

1. Leaves deeply sinuate-margined to pinnatifid or pinnatisect; scapes broadly winged; calyx limb bluish-violet, truncate (not lobed); petals pale yellow to whitish 1. *L. sinuatum* (L.) Mill.
- 415 + Leaves fully entire; scapes terete, angled, or very narrowly winged. 2.
2. Perennial plants, often with a short more or less woody caudex 3.
- + Subshrubs with fairly long ligneous leafy branches (Section *Sarcophyllum* (Boiss.) Lincz.) 28.

3. Calyx funnellform or obconical 4.
- + Calyx tubular, with a very slightly recurved, suberect or erect limb (i.e. practically limbless) (Section Siphonocalyx Lincz.) 30.
4. Calyx rather broadly funnellform, with a broad limb, strongly oblique at base (Section Platyhymenium Boiss.) 5.
- + Calyx obconical or narrowly (rarely fairly broadly) funnellform, with a rather narrow limb, slightly oblique to nearly straight at base (Section Limonium Boiss.) 16.
5. The lower nodes of the scape commonly with 1-3 (5) fairly large leaves (though much smaller than the radical leaves) 6.
- + Scapes always leafless (merely with fairly large herbaceous-scarious or scarious scales) 7.
6. Petals violet-rose or rose; calyx 6-7 mm long; scapes erect, few or mostly solitary (Baikal region) 2. *L. flexuosum* (L.) Ktze.
- + Petals pale yellow; calyx 3-4.5 mm long; scapes procumbent-ascending, numerous (Altai and Tuva area*) 3. *L. congestum* (Ldb.) Ktze.
7. Petals yellow; calyx limb yellow, rose-violet (lilac) or whitish . . . 10.
- + Petals reddish-violet or rose-violet; calyx limb bluish-violet or rose-violet (lilac), drying whitish 8.
8. Leaves fairly large, up to 8 cm long (Caucasus) 6. *L. Fischeri* (Trautv.) Lincz.
- + Leaves very small, up to 3 cm long (Soviet Central Asia) 9.
9. Calyx (7) 8-11 mm long, the limb with long lobes; bracts always glabrous 4. *L. kaschgaricum* (Rupr.) Ik.-Gal.
- + Calyx 5-6 (7) mm long, the limb with short rounded lobes; bracts glabrous or rarely pubescent 5. *L. Hoeltzeri* (Rgl.) Ik.-Gal.
10. Petals yellow; calyx limb rose-violet (to pale lilac) or if whitish then all bracts glabrous and scapes densely and minutely verrucose) . . . 11.
- 416 + Petals yellow; calyx limb yellow or if whitish then the first inner bract and sometimes also the outer bract pubescent and scapes smooth or nearly so 12.
11. Calyx (6) 7-9 mm long, the limb rose-violet, with large acutely triangular lobes; scapes smooth or nearly so, always erect, with very few usually simple sterile branches. . . . 8. *L. leptolobum* (Rgl.) Ktze.
- + Calyx 4.5-6 mm long, the limb whitish or pale lilac, with small broadly triangular round-tipped lobes; scapes densely and minutely verrucose all the way down, mostly more or less ascending, with fairly numerous commonly branched sterile branches. 9. *L. Michelsonii* Lincz.
12. Calyx limb whitish or pale yellow; scapes with few sterile branches. 7. *L. dichroanthum* (Rupr.) Ik.-Gal.
- + Calyx limb bright (lemon or golden) yellow; scapes with numerous sterile branches. 13.
13. Calyx limb golden-yellow; sterile branches of the scape strongly flexuous or recurved and rather strongly branched (Transbaikalia and Tuva area) 13. *L. aureum* (L.) Hill.
- + Calyx limb lemon-yellow; sterile branches of the scape straight or nearly so, simple or fairly strongly branched (Soviet Central Asia). 14.

* [Tuva Autonomous Region.]

14. Sterile branches of the scape long, solitary, commonly also long-branched; bracts glabrous 12. **L. Rezniczenkoanum** Lincz.
- + Sterile branches of the scape short, in fascicles of 3-5, simple or rarely very slightly branched 15.
15. Scapes rather densely and finely verrucose; outer bract and first inner bract nearly always glabrous 10. **L. chrysocomum** (Kar. et Kir.) Ktze.
- + Scapes smooth; outer bract and first inner bract nearly always densely covered with long hairs 11. **L. Semenovii** (Herd.) Ktze.
16. Leaves all radical and if very rarely borne also on the lower part of scapes then resembling radical leaves in shape and rather distinctly petiolate 17.
- + Leaves radical and on the scape, the latter differing in shape, sessile, rounded-auricular or reniform, more or less clasping or perfoliate. 27.
- 417 17. Leaves large (up to 15-30 (60) cm long and 5-10 (15) cm broad), rather rigid and coriaceous, not dying off after anthesis; scapes commonly few 18.
- + Leaves small (up to 3-6 cm long and 1.5-2 cm broad), rather soft, after anthesis dying off completely or nearly so; scapes commonly numerous 24.
18. Leaves subovate to rather broadly and oblongly elliptic, rarely obscurely obovate 19.
- + Leaves broadly obovate or spatulate 26.
19. The entire plant (except the always more or less pubescent calyx) glabrous 20.
- + Plant pubescent in varying degree (sometimes rather densely, subvelutinosely — but often only partly — pubescent) 22.
20. Sterile branches in the lower and middle parts of inflorescence numerous; calyx narrowly funnelform, with distinct lobes ca. 1 mm long 19. **L. Bungei** (Claus) Gamajun.
- + Sterile branches of inflorescence few or none; calyx obconical, the lobes not exceeding ca. 0.5 mm or sometimes obsolescent 21.
21. Inflorescence relatively few-branched, rather contracted, usually subcorymbose or pyramidal; flowers in rather dense spikes 14. **L. Gmelinii** (Willd.) Ktze.
- + Inflorescence strongly branched (sometimes nearly from base), branched, spreading, loosely paniculate; flowers in loose or fairly loose spikes 15. **L. Meyeri** (Boiss.) Ktze.
22. Sterile branches in lower and middle parts of inflorescence numerous; inflorescence spreading relatively little; calyx narrowly funnelform, the lobes distinct and ca. 1 mm long 18. **L. sareptanum** (Becker) Gams.
- + Sterile branches of inflorescence few or none; calyx obconical, the shorter lobes not exceeding ca. 0.5 mm or sometimes obsolescent. 23.
23. Inflorescence relatively few-branched, more or less contracted, commonly corymbose or pyramidal; flowers in rather dense spikes; bracts nearly always rather densely pubescent, rarely glabrous; calyx ca. 3.5-5 mm long 16. **L. tomentellum** (Boiss.) Ktze.

- + Inflorescence very strongly and finely paniced, strongly spreading to subspherical; flowers in loose or fairly loose spikes; bracts always glabrous; calyx ca. 3-3.5 mm long 17. *L. latifolium* (Sm.) Ktze.
24. The entire plant (except the calyx) glabrous; scapes and their branches rather densely and finely verrucose (especially at the ends); calyx obconical, ca. 3-4.5 mm long, rather rarely pubescent and sometimes merely on the nerves 20. *L. caspium* (Willd.) Gams.
- + The whole or nearly the whole plant rather densely hairy. 25.
25. A relatively large plant, 20-50 cm tall; large obovate or oblong-spatulate, 0.5-3.5 cm long and 0.3-2 cm broad; scales at the base of scapes usually large, brown; calyx obconical or very slightly funnel-form, ca. 2.5-3.5 mm long 21. *L. coralloides* (Tausch) Lincz.
- + A relatively small plant, 5-15 cm tall; leaves linear or narrowly oblanceolate, 0.5-1 cm long and ca. 1 mm broad; scales at the base of scapes usually small, whitish; calyx rather broadly funnel-form, ca. 4-5 mm long 22. *L. macrorrhizon* (Ldb.) Ktze.
26. Sterile inflorescence branches numerous; outer bract scarious except the very base and the narrow midrib; calyx narrowly funnel-form to subobconical, ca. 3 mm long 23. *L. myrianthum* (Schrenk) Ktze.
- + Sterile inflorescence branches none; outer bract herbaceous and rather broadly scarious-margined; calyx broadly funnel-form, ca. 5-6 mm long 24. *L. ferganense* Ik.-Gal.
27. Sterile inflorescence branches very numerous, compoundly and slenderly branched; leaves on scapes few, confined to the lower nodes and the lower part of branches; spikes short, gathered in a dense panicle 25. *L. otolepis* (Schrenk) Ktze.
- + Sterile inflorescence branches none or very few; leaves on scapes very numerous, at nearly all the nodes of scape and branches; spikes rather long, gathered in a loose panicle with strongly spreading branches. 26. *L. reniforme* (Girard) Lincz.
28. Leaves with two large auricular scarious appendages at the petiole base; flowers in capitate, sessile fascicles borne interruptedly in spikes on the upper part of simple or few-branched scapes 27. *L. suffruticosum* (L.) Ktze.
- + Leaves unappendaged at the petiole base or rarely with very small appendages; flowers in rather loose oblong spikes borne on the terminal branches of rather strongly branched scapes and forming a fairly distinct loosely paniculate inflorescence 29.
29. Leaves subcylindrical, slightly flattened, not enlarged or almost imperceptibly enlarged at apex (Soviet Central Asia) 28. *L. leptophyllum* (Schrenk) Ktze.
- + Leaves linear-spatulate (Caucasus) . . . 29. *L. carnosum* (Boiss.) Ktze.
30. Spicules in loose spikes, with joints 0.5-2 cm long, on the terminal branches of the scapes 30. *L. sogdianum* (M. Pop.) Ik.-Gal.
- + Spicules in compact spikes borne 1-3 at the ends of scape branches. 31.
31. Outer bract obtuse, 2.5-3.5 mm long, the first inner bract 2-2 $\frac{1}{2}$ times as long; bracts and calyx covered with simple hairs 31. *L. drepanostachyum* Ik.-Gal.
- + Outer bract more or less pointed, 5-6 mm long, the first inner bract only half as long again; bracts and calyx covered with finely glandular hairs 32. *L. Fajzievii* Zakirov.

Section 1. **PTEROCLADOS** Boiss. in DC. Prodr. XII (1848) 635 et Fl. or. IV (1879) 856; Pax in Engl. — Pr. Pflanzenfam. IV. 1 (1891) 124. — Scapes broadly winged; calyx funnelform, with a broad limb, straight at base. Perennial plants (in the USSR), subshrubs and shrubs (in subtropical W. Mediterranean area).

1. **L. sinuatum** (L.) Mill. Gard. Dict. ed. 8 (1768) No. 6; Gams in, Hegi, Ill. Fl. V, 3, 1881; Grossg. Opred. rast. Kavk. 593. — *Staticé sinuata* L. Sp. pl. (1753) 276; Ldb. Fl. Ross. III, 467; Boiss. in DC. Prodr. XII, 635 et Fl. or. IV, 857; Kuzn. in Mat. Fl. Kavk. IV, 1, 209; Grossg. Fl. Kavk. ed. 1, III, 218. — *S. hirsuta* Presl, Bot. Bemerk. (1844) 105, nomen. — Ic.: Bot. Mag. II (1796) tab. 71; Sibth. et Sm. Fl. graeca, IV (1823) tab. 301; Gartenfl. XXX (1881) 280. — Exs.: Bourg. Pl. d'Esp. Nos. 420, 1440; Jamin, Pl. d'Alger, No. 76; Heldr. Herb. graec. norm. No. 188; Balansa, Pl. d'Orient, No. 279.

Biennial or perennial, 10-50 (70) cm tall, rather densely covered throughout with spreading fairly long stiff whitish hairs; leaves all radical, numerous, fairly thin, pale green, oblong-spatulate, 3-10 (25) cm long and 1-3 (6) cm broad, deeply sinuate-margined to pinnatifid or pinnatisect, the lateral lobes and the sinuses obtuse and rounded, the terminal segment usually larger and finely pointed, the petiole fairly short; scapes (1) 5-15, erect or ascending, dichotomously branched in upper part or merely at the top, winged all the way up from the base or nearly so, the wings rather broad thin
420 crisped-undulate and produced at the nodes into narrowly linear foliaceous appendages up to 5-7 cm long; spikes up to 1.5-2 cm long and ca. 1.5 cm broad, dense, always furnished with 3 unequal ovate or ovate-lanceolate, pointed appendages of the wings of inflorescence branches, forming corymbose heads at the ends of the branches; spicules 3- or 4-flowered; outer bract rufous-membranous, narrowly triangular to lanceolate, subulately long-acuminate; first inner bract slightly longer and much broader than the outer bract and about equaling the calyx tube, rigidly herbaceous, strongly involute and enclosing the calyx, with 2 ciliate dorsal keels, and produced into 2 or 3 large unequal 2- or 3-toothed appendages; other inner bracts (one per flower) narrow, scarious, point-tipped; calyx 10-14 mm long, funnelform, the tube ca. 6-8 mm long and 1 mm in diameter, minutely puberulous; calyx limb 4-6 mm broad, bluish-violet, truncate (not lobed); the narrow nerves terminating distinctly below the margin; petals pale yellow to whitish. Fl. August-September; fr. September.

Reported as a weedy adventitious plant. — W. Transc. (Batumi area).

Gen. distr.: Med. (W. and E.), Bal.-As. Min. Described from the Mediterranean area. Type in London.

Economic importance. Often grown as ornamental on account of the brightly colored calyx and the striking habit.

Section 2. **PLATYHYMENIUM** Boiss. in DC. Prodr. XII (1848) 640; Pax in Engl. — Pr. Pflanzenfam. IV, 1 (1891) 124. — Scapes terete, angled, or very narrowly winged; calyx rather broadly funnelform, with a broad limb, strongly oblique at base. Perennial plants.



Plate XXI

1. *Armeria arctica* (Cham.) Wallr., 1a) scape sheath, 1b) calyx, 1c) ovary. 2. *A. elongata* (Hoffm.) C. Koch, calyx. 3. *Limonium flexuosum* (L.) Ktze., 3a) calyx, 3b) ovary. 4. *L. chrysocomum* (Kar. et Kir.) Ktze., 4a) calyx.

Series 1. **Flexuosa** Lincz. — Scapes with 1-3 (5) fairly large leaves at the nodes; spikes dense, gathered in heads at the ends of scape branches. Series type: *L. flexuosum* (L.) Ktze

2. ***L. flexuosum*** (L.) Ktze. Rev. gen. II (1891) 395. — *Statice flexuosa* L. Sp. pl. (1753) 276; Ldb. Fl. Ross. III, 462; Boiss. in DC. Prodr. XII, 640; Turcz. in Bull. Soc. Nat. Mosc. XXV, 3 (1852) 396 (Fl. baic.-dah. No. 927). — *S. rosea* Pall. Reise, III (1776) 260, nomen. — 423 *S. daurica* Pall. l.c. 320, 425, nomen. — Ic.: Gmel. Fl. sib. II, tab. 89, f. 1; Hill, Veg. syst. V, tab. 14, f. 1.

Perennial, (5) 10-45 cm tall, glabrous throughout (except the calyx and often the first inner bract); leaves nearly all radical, fairly numerous, rather rigid, pale green or glaucous-green, obovate to oblong-obovate or subspatulate, (2) 4-6 (12) cm long and 0.5-1.5 (2.5) cm broad, rarely narrower, linear-lanceolate, 2-7 cm long and 0.2-0.5 cm broad (var. *angustifolium* Ik.-Gal.), obtuse and round-tipped or minutely mucronate, gradually tapering at base into, and equaling or markedly longer than, the broad flat petiole; scapes solitary or less often 2-10, erect, mostly slightly flexuous, toward base subterete, upward (like the branches) angled, in upper part or rarely nearly from base more or less branched, at lower nodes commonly with 1-3 (5) leaves, these fairly large though smaller than the radical ones; spikes ca. 1 cm long and as broad, compactly 9-13-spiculed, distichous, scorpioid, in capitate clusters of 2 or 3 at the ends of scape branches; spicules 2-4-flowered; outer bract ca. 3-4 mm long, markedly shorter and narrower than the first inner bract, broadly obovate or ovate or suborbicular, short-acuminate, rigidly herbaceous, rose-violet, broadly scarious-margined; first inner bract similar but from half as long again to twice as long, ca. 5-6 mm long, broadly scarious-margined, obtuse, glabrous or more or less densely covered on the back with rather long hairs; other inner bracts obovate, scarious, with or without a narrow midrib; calyx 6-7 mm long, rather broadly funnelform, the obconical tube ca. 3 mm long and 1 mm in diameter, rather densely covered with long hairs on the nerves all the way up and also between them in lower half or three-quarters; calyx limb ca. 3 mm broad, whitish, rather distinctly 5-lobed, the nerves reaching the margin, narrow, hairy in lower part, pinkish; petals violet-rose or rose. Fl. July-August; fr. August (Plate XXI, Figures 3, 3a, 3b).

Stony steppe slopes, steppes, saline meadows, and sparse pine woods. — E. Siberia: Ang.-Say. (in the vicinity of Irkutsk), Dau. Gen. distr.: Mong. Described from "Siberia". Type in London.

3. ***L. congestum*** (Ldb.) Ktze. Rev. gen. II (1891) 395. — *L. Iljinii* Sobolevsk. in Bot. Mat. Gerb. Bot. Inst. AN SSSR, XIV (1951) 48. — *Statice congesta* Ldb. Fl. alt. I (1829) 437 et Fl. Ross. III, 468; Boiss. in DC. Prodr. XII, 640; Kryl. Fl. Zap. Sib. IX, 2159. — Ic.: Ldb. Ic. Fl. Ross. IV, tab. 314; Sobolevsk. l.c. Fig. 1. 424 Perennial; 5-20 cm tall, glabrous throughout except for calyx; leaves nearly all radical, numerous, rather rigid, glaucescent-green, oblong-obovate to lanceolate, 1.5-4 (7) cm long and 0.3-1.2 cm broad, obtuse, round-tipped or short-acuminate, very gradually tapering at base into, and equaling or slightly longer than, the narrow petiole; scapes 5-25, procumbent-ascending, angled, rather strongly branched sometimes nearly from base, the lower nodes commonly with 1 or 2 small leaves resembling

the radical ones; spikes 1-2 cm long and 0.7-0.8 cm broad, compactly (5) 10-20-spiculed, distichous, mostly more or less recurved, subcapitately clustered at the ends of scape branches; spicules 2-5-flowered; outer bract ca. 2 mm long, broadly obovate to suborbicular, obtuse, rigidly herbaceous, broadly scarious-margined; first inner bract resembling but about twice the length of the outer bract, ca. 4 mm long, more broadly scarious-margined; other inner bracts ovate, scarious, with or without a narrow midrib; calyx (3) 4-4.5 mm long, rather broadly funnelform, the tube obconical, ca. 2 mm long and 1 mm in diameter, densely covered on the nerves all the way up or rarely merely at base with rather long hairs; calyx limb ca. 2 mm broad, whitish or violet-rose, rather distinctly 5-lobed (finally rupturing at the top into narrow lobules), the nerves reaching the margin, narrow, often hairy in lower part; petals pale yellow. Fl. June-July; fr. July.

Solonchaks and saline meadows, sometimes in *Lastagrostis splendens* stands. — W. Siberia: Alt. (Chuiskaya Steppe); E. Siberia: Ang.-Say. (SW part of Tuva Autonomous Region). **Gen. distr.:** Mong. Described from the Chuiskaya Steppe. Type in Leningrad.

Note. The author is unable to distinguish between *L. Iljinii*, described from the Tuva Autonomous Region by K. A. Sobolevskaya, and *L. congestum*. It appears from the type specimens of *L. Iljinii* preserved in Leningrad that the calyx of this plant is about 3-3.5 mm long (this as well as the whitish color of the calyx are often to be found in specimens of *L. congestum* from the Chuiskaya Steppe), while the petals, contrary to the author's assertion, are not white but pale yellow, just as in the case of *L. congestum*. As far as the overall size of the plant is concerned, such low-growing specimens are also known from the Chuiskaya Steppe.

Series 2. **Tenella** Lincz. — Petals reddish-violet or rose-violet; calyx limb rose violet (lilac); scapes with fairly numerous sterile branches; leaves very small, up to 3 cm long. Series type: *L. tenellum* (Turcz.) Ktze.

4. **L. kashgaricum** (Rupr.) Ik.-Gal. in Tr. Bot. inst. AN SSSR, ser. I, 2 (1936) 255, in observ. — *Statice kaschgarica* Rupr. in Mem. Acad. Sc. Petersb. VII ser. XIV, 4 (1869) 69. — *S. tenella* Rgl. in Tr. Bot. Sada, VI, 2 (1880) 385 and Fedch. O. and B. Perech. rast. Turk. V, 182, pp. non Turcz.

Perennial, 10-25 cm tall, glabrous throughout except the calyx; taproot stout, woody, tough; caudex strongly thickened, densely clothed in remnants of leaf petioles and membranous scales; leaves all radical, numerous but early withering and falling off, glaucescent-green, oblong-spatulate to sub lanceolate, very small, 1-3 cm long and 0.2-0.5 cm broad, gradually acuminate to nearly round-tipped, sometimes mucronate, gradually tapering at base into, and about as long as or slightly shorter than, the flat petiole; scapes 20-50 (70), erect, all more or less terete and smooth, more or less flexuous, with rather long internodes, paniced nearly from base, with fairly numerous and secondarily divided sterile branches; spikes 1-1.5 cm long, rather compactly 3-7-spiculed, subcapitately clustered in twos or threes or solitary at the ends of scape branches; spicules 2-3 (7)-flowered, the flowers borne on pedicels up to 2 mm long; outer bract 1.5-3 mm long,

broadly ovate, obtusish, round-tipped or slightly acuminate, broadly scarious along the entire margin, glabrous; first inner bract similar but 2-4 times as long, strongly concave and partly enclosing the flowers, very broadly scarious-margined, glabrous; outer inner bracts (one per flower) slightly smaller, scarious, the narrow midrib not reaching the apex; calyx (7) 8-11 mm long, broadly funnelform, the tube obconical, ca. 4-5 mm long and 1 mm in diameter, densely covered throughout on and between the nerves with very long hairs; calyx limb ca. 4-6 mm broad, rose-violet or lilac, drying whitish, 5 (or more or less distinctly 10)-lobed, the primary lobes long and rather broadly triangular to subovate, acuminate or rounded at apex, reaching the margin or more rarely excurrent in a very short point (not more than 0.5 mm long), covered with rather long hairs; intermediate lobes, when present, much smaller, rounded; petals reddish-violet. Fl. June-July; fr. July-August.

Stony mountain slopes. — Soviet Central Asia: Tien Shan. (S. part on the border with Sinkiang, and the Issyk-Kul' depression — a nontypical form), Pam.-Al. (Trans-Ili Range, Dzhegen natural boundary). **Gen. distr.:** Dzu.-Kash. (S. slopes of Tien Shan, in the area from the Kizyl-Su River to the Muzart River). Described from the Toyun (Toyanda) NW of Kashgar. Type in Leningrad.

Note. A species related to the Mongolian *L. tenellum* (Turcz.) 426 Ktze. and forming together with it and *L. Hoeltzeri* (Rgl.) Ik.-Gal. (described below) a natural series.

5. *L. Hoeltzeri* (Rgl.) Ik.-Gal. comb. n. — *L. amblyolobum* Ik.-Gal. in Tr. Bot. inst. AN SSSR, ser. I, 2 (1936) 270. — *Statice Höltzeri* Rgl. in Tr. Bot. Sada, V (1877) 259. — *S. tenella* Rgl. in Tr. Bot. Sada, VI, 2 (1880) 385 and Fedch. O. and B. Perech. rast. Turk. V, 182, p. p. non Turcz. — Ic.: Ik.-Gal., l. c., Fig. 6.

Perennial, 5-15 cm tall, glabrous (except calyx and occasionally bracts); root stout, woody, tough; caudex strongly thickened, many-headed, densely clothed in remnants of leaf petioles and large membranous scales; leaves all radical, numerous but early withering and falling off, glaucescent-green, oblong-spatulate to sub lanceolate, (0.5) 1-2.5 cm long and 0.1-0.4 cm broad, gradually acuminate, sometimes mucronate, gradually tapering at base into, and about as long as or slightly shorter than, the flat petiole; scapes 10-25 (50), erect, more or less terete, smooth or (mostly at the top) finely verrucose, more or less flexuous, with rather short internodes, paniced nearly from base, with fairly numerous and mostly secondarily divided sterile branches; spikes ca. 0.8-1 cm long, rather compactly 3-7-spiculed, capitately clustered in twos or threes or solitary at the ends of scape branches; spicules 3-5 (7)-flowered, the flowers borne on pedicels up to 2 mm long; outer bract 1.5-2 mm long, broadly ovate, obtusish or slightly pointed, broadly scarious-margined, glabrous or rarely pubescent; first inner bract similar but much larger, 2-3 times as long, strongly concave and partly enclosing the flowers, very broadly scarious-margined, glabrous or rarely pubescent; other inner bracts (one per flower) sometimes smaller, scarious, the narrow midrib not reaching the apex; calyx 5-6 (7) mm long; broadly funnelform, the tube obconical, ca. 2.5-3.5 mm long, covered throughout with long hairs on and between the nerves; calyx limb ca. 2.5-3.5 mm broad, rose-violet or lilac, drying whitish, 5-lobed, the lobes short rounded-triangular obtusish, the nerves reaching the margin, covered

with long hairs; petals reddish-violet or rose-violet. Fl. June-July; fr. July-August.

Dry stony mountain slopes and plateaus. — Soviet Central Asia: Tien Shan (Central desert part and the Issyk-Kul' depression). — **Gen. distr.:** Dzu. - Kash. (E. Tien Shan). Described from the Chu River valley between the village of Tokmak and Lake Issyk-Kul'. Type in Leningrad.

427 **Note.** A species very closely related to *L. kashgaricum* (Rupr.) Ik.-Gal.; beside the mostly low growth, about the only distinguishing characteristic is their smaller flowers. Further study in the natural habitats is needed.

Series 3. Nuda Lincz. — Petals rose-violet; calyx limb bluish-violet; scapes with fairly numerous sterile branches; leaves fairly large, up to 8 cm long. Series type: *L. nudum* (Boiss. et Buhse) Ktze.

6. **L. Fischeri** (Trautv.) Lincz. comb. n. — *L. nudum* Ktze. Rev. gen. II (1891) 395, p.p. — *L. nudum* Grossh. Opred. rast. Kavk. (1949) 594. — *Statice Fischeri* Trautv. in Tr. Bot. Sada, II (1873) 481. — *S. nuda* Boiss. Fl. or. IV (1879) 864 et Kuzn. in Mat. Fl. Kavk. IV, 1 (1903) 217, p.p. quoad pl. cauc. — *S. nuda* Grossh. Fl. Kavk. ed. 1, III (1932) 219, non Boiss. et Buhse. — Exs.: Pl. or. exs. No. 370.

Perennial, 30-60 cm tall, glabrous throughout except the calyx and bracts; root thick, woody; caudex strongly thickened, commonly many-headed, densely clothed in remnants of leaf petioles; leaves all radical, fairly numerous but nearly withering and falling off, glaucescent-green, oblong-spatulate, 4-8 cm long and 0.5-2 cm broad, more or less round-tipped, obtuse or short-pointed, very gradually tapering at base into, and about as long as, the flat petiole; scapes 5-15, erect, more or less terete and smooth, more or less flexuous, with long internodes, paniced nearly from base, with fairly numerous and mostly secondarily divided sterile branches; spikes 2-4 cm long, 5-9 (12)-spiculed, rather compactly capitate or loosely oblong, borne at the ends of the upper mostly shorter scape branches; spicules (2) 3-5-flowered, the flowers borne on pedicels up to 2 mm long; outer bract ca. 3 mm long, broadly ovate, obtusish or slightly pointed, broadly scarious-margined, rather densely pubescent or rarely glabrous; first inner bract similar, but 2 1/2-3 times as long, strongly concave and partly enclosing the flowers, very broadly scarious-margined, densely covered with fairly long hairs; other bracts (one per flower) a quarter to one-third as long as the first inner bract, scarious, the narrow midrib not reaching the summit; calyx 9-12 mm long, broadly funnelform, the tube obconical, ca. 4-5 mm long and 1.5 mm in diameter, densely covered throughout with long hairs on and between the nerves; calyx limb ca. 5-7 mm broad, bluish-violet, drying whitish, deeply 5-lobed, the lobes 428 oblong-elliptic, acuminate, slightly narrowed toward base, the nerves reaching the margin or occasionally scarcely excurrent, covered with rather long hairs; petals rose-violet. Fl. May-June; fr. June.

Dry stony slopes and limestone outcrops in low mountains. — Caucasus: S. Transc. Endemic? (very likely occurring in the adjoining areas of Iran). Described from the Araks River basin (Alindzhachai R. between Nakhichevan and Dzbul'fa. Type in Leningrad.

Note. *L. nudum* (Boiss. et Buhse) Ktze., with which *L. Fischeri* has often been confused, was described from the northern slopes of the

Elburz Range near Gorgan (Astrabad) and the Kashan area and differs markedly in the large scarious inner bracts that equal the first inner bract (and are not a quarter to one-third as long) and the more numerous flowers (10-12) in spicule. The two species form a natural series, undoubtedly related to the series *Tenella*.

Series 4. ***Dichroantha*** Lincz. — Petals yellow; calyx limb rose-violet, whitish, or pale yellow; scapes mostly with few sterile branches. Series type: *L. dichroanthum* (Rupr.) Ik.-Gal.

7. ***L. dichroanthum*** (Rupr.) Ik.-Gal. comb. n. — *Statice dichroantha* Rupr. in Mem. Acad. Sc. Petersb. VII ser. XIV, 4 (1869) 69; Fedch. O. and B. Perech. rast. Turk. V, 184.

Perennial, glabrous throughout except calyx and bracts; root fairly stout; caudex rather strongly thickened, woody; leaves all radical, numerous glaucescent-green, oblong-spatulate, 2-4 cm long and ca. 1 cm broad, round-tipped, gradually narrowed at base and longer than or about as long as the flat petiole; scapes 2-8, erect, all terete, smooth or nearly so, more or less flexuous, with long and more or less curved internodes, paniced nearly from base; sterile branches very few, simple; spikes 1-1.5 cm long, compactly 5-11-spiculed, subcapitately clustered in twos or threes at the ends of scape branches; spicules 4-7 (11)-flowered, the flowers borne on pedicels 1-1.5 mm long; outer bract ca. 3-4 mm long, broadly obovate or elliptic, obtusish or subtruncate, broadly scarious-margined, glabrous or rarely sparsely pubescent on the rigidly herbaceous back; first inner bract similar, but twice as long, strongly concave and partly enclosing the flowers, very broadly scarious-margined, rather densely covered on the back with fairly long hairs; other inner bracts (one 429 per flower) slightly smaller, scarious, the narrow midrib not reaching the summit; calyx 5-7 mm long, broadly funnelform, the tube obconical, ca. 3 mm long and 1 mm in diameter, densely covered the whole length with rather long hairs on the nerves and sometimes also between them; calyx limb (2.5) 3-4 mm broad, whitish or pale yellow, 5-lobed, the lobes rather short, broadly triangular, more or less rounded at apex, the nerves excurrent in a short point, covered in lower part with short hairs; petals yellow. Fl. July-August; fr. August-September.

Stony fine-earth mountain slopes. — Soviet Central Asia: Tien Shan (Naryn and Talass, ? Fergana Range). Endemic. Described from the Naryn River toward the Dzhaman-Daban Pass. Type in Leningrad.

Note. The specific identity of the typical specimen (from the Naryn River basin). and of the samples from the Talass [River] needs additional confirmation with more ample material.

8. ***L. leptolobum*** (Rgl.) Ktze. Rev. gen. II (1891) 395. — *Statice leptoloba* Rgl. in Tr. Bot. Sada, VI, 2 (1880) 385 (incl. var. β . *subaphylla* Rgl.) in Gartenfl. XXX (1881) 164; Fedch. O. and B. Perech. rast. Turk. V, 184. — ? *S. juncea* Tatarinow ex Wlangali in Beitr. z. Kenntn. Russ Reich. XX (1856) 251, nomen; Fedch. O. and B. l. c. 186. — Ic.: Gartenfl. l. c. tab. 1045; Vestn. Ross. Obshch. sadov. (1881) 188.

Perennial, (15) 25-40 cm tall, glabrous throughout except calyx; root mostly rather slender; caudex rather strongly thickened; leaves all radical, mostly numerous, glaucescent-green, narrowly or fairly broadly spatulate,

2-6 cm long and 0.5-1.5 cm broad, round-tipped, gradually tapering at base into, and as long as or slightly longer than, the flat petiole; scapes (2) 5-15, erect, all terete, smooth or nearly so, more or less flexuous, with rather long and more or less curved internodes, panicked nearly from base; sterile branches very numerous, nearly always simple; spikes 1-2 cm long, rather compactly 3-9-spiculed, subcapitately clustered in twos or threes at the ends of scape branches; spicules (2) 4-7-flowered, the flowers borne on pedicels ca. 1-1.5 mm long; outer bract 1.5-3 mm long, broadly ovate or obovate, obtusish, round-tipped to subtruncate and often distinctly emarginate, broadly scarious-margined, always glabrous; first inner bract similar but 2-4 times as long, strongly concave and partly enclosing the flowers, very broadly scarious-margined, always glabrous; other inner
430 bracts (one per flower) slightly smaller, scarious, the narrow midrib not reaching the summit; calyx (6) 7-9 mm long, broadly funnelform, the tube obconical, ca. 3-3.5 mm long and ca. 1 mm in diameter, densely covered all the way up or only to the middle with very long hairs on the nerves or also between them; calyx limb ca. 3-4 mm broad, rose-violet to pale lilac, drying whitish, 5-lobed, the lobes long, narrowly triangular, acuminate, the nerves excurrent in a point up to 1 mm long, covered with short hairs or bare; petals yellow. Fl. May-July (September); fr. July-August (September).

Sandhills, solonchaks, and stony places in foothills. — Soviet Central Asia: Balkh. (upper part of the Ili R. valley east of the town of Iliisk [Ili], and at the northern foot of the Ketmen Range). **Gen. distr.:** Dzu.-Kash. (Ili R. basin and Lake Ebi Nor). Described from Sinkiang: northern foot of the Eren Habirga Mountains (in description erroneously "Kenkha") in the Dzhinkho area, the lower reaches of the Borotala, in the vicinity of the town of Kuldja. Type and paratype in Leningrad.

Note. The variety distinguished by Regel (l. c.), var. β . *subaphylla* Rgl., was described from dried up specimens, with leaves fallen off, as evident from the type specimens.

9. **L. Michelsonii** Lincz. sp. n. in Addenda XVII, 747. — *Statice leptoloba* Michelson in Tr. pochv.-bot. eksp. Peresel, upr. II, 4 (1913) 54, non Rgl. — *S. amblyoloba* M. Pop. Fl. Almat. zapovedn. (1940) 37, non Ik.-Gal. — *S. dichroantha* Ik.-Gal. in herb. p. p. non Rupr. — Exs.: Ed. H. B. P. No. 43 (sub *S. leptoloba* Rgl.).

Perennial, 10-25 cm tall, glabrous throughout except calyx; taproot rather slender; caudex rather thick; leaves all radical, few, glaucescent-green, rather broadly spatulate, 1.5-4 cm long and (0.3) 0.5-1 cm broad, round-tipped, gradually tapering at base into the flat petiole, which is shorter than the blade or subequal to it; scapes 5-15, ascending to suberect, all terete, minutely verrucose throughout or merely at the top, very strongly flexuous, with short and more or less curved internodes, panicked nearly from base; sterile branches fairly numerous, mostly secondarily divided; spikes 1-1.5 cm long, compactly 5-10-spiculed, subcapitately clustered in twos or threes at the ends of scape branches; spicules 4-7 (10)-flowered, the flowers borne on pedicels up to 1-1.5 mm long; outer bract 2.5-3 mm long, broadly ovate, obtusish or occasionally scarcely emarginate, broadly scarious-margined, always glabrous; first inner bract similar but twice as long (or even longer), strongly concave and partly
431 enclosing the flowers, very broadly scarious-margined, always glabrous;

calyx 4.5-6 mm long, broadly funnelform, the tube obconical, 2.5-3 mm long and ca. 1 mm in diameter, covered throughout with rather long hairs on and between the nerves; calyx limb 2.5-3 mm broad, whitish or pale lilac, 5-lobed, the lobes rather short, broadly triangular, round-tipped and sometimes scarcely emarginate, the nerves as a rule distinctly excurrent in a short point, covered in lower part or the whole length with short hairs; petals yellow. Fl. June-August; fr. July-September.

Commonly on solonchaks, sometimes on stony slopes (outcrops of mottled strata), in the intermediate and lower mountain zones. — Soviet Central Asia: Tien Shan (Ketmen and Sogotinskie Mts.). Endemic. Described from the Kegen River valley (between Kara-Saz and Kegen-Saz). Endemic. Type in Leningrad.

Note. Differing from *L. dichroanthum* (Rupr.) Ik.-Gal. in the sometimes pale lilac (not pale yellow) calyx limb, and from *L. leptolobum* (Rgl.) Ktze. in the shorter calyx with short and broad rounded lobes. In addition, it is distinguishable from both species by the densely and minutely verrucose and strongly flexuous scapes with short internodes and the relatively numerous sterile branches.

Series 5. **Chrysocoma** Lincz. — Petals orange-yellow; calyx limb lemon-yellow; scapes commonly once branched, with numerous clustered sterile branches, which are nearly always simple and straight or nearly straight. Series type: *L. chrysocomum* (Kar. et Kir.) Ktze.

10. *L. chrysocomum* (Kar. et Kir.) Ktze. Rev. gen. II (1891) 395. — *L. Schrenkianum* Ktze. l.c. 396. — *Statice chrysocoma* Kar. et Kir. in Bull. Soc. Nat. Mosc. XV (1842) 429 (Enum. pl. songor. No. 668); Boiss. in DC. Prodr. XII, 641; Ldb. Fl. Ross. III, 466; Perech in Tr. Bot. Sada, VI, 2, 383, in note; Fedch. O. and B. Perech. rast. Turk. V, 185; Kryl. Fl. Zap. Sib. IX, 2161. — *S. Schrenkiana* Fisch. et Mey. in Bull. Acad. Petersb. I (1843) 362; Boiss. l.c. 641; Ldb. l.c. 458; Regel, l.c. 383, in note; Fedch. O. and B. l.c. 184. — *S. halochrysa* Fisch. ex Boiss. l.c. 641, pro syn. — Exs.: Kar. et Kir. Pl. songor. No. 1855; GFR, No. 1035 (sub *S. Schrenkiana* Fisch. et Mey.).

Perennial, 5-15 (20) cm tall; taproot stout, woody; caudex strongly thickened, many-headed, stocky, densely clothed in remnants of leaf petioles and large membranous scales; leaves all radical, fairly numerous, glaucescent-green, linear-lanceolate to oblong-spatulate, 0.5-1.5 (2.5) cm long and 0.1-0.4 cm broad, gradually acuminate or more or less rounded at apex, commonly whitish-mucronate, very gradually tapering at base into
432 and about as long as the flat petiole; scapes 20-50, erect or the lateral ones slightly ascending, terete below, slightly angled upward, rather densely and minutely verrucose, gently flexuous to nearly straight, often but simply branched; sterile branches in threes to fives from numerous approximate nodes, slender, nearly straight, nearly always simple, much longer than the subtending rather large triangular-lanceolate membranous scales; spikes ca. 1.5-2 cm long, compactly 3-5 (7)-spiculed, capitately clustered in twos or threes or solitary at the ends of scape branches; spicules 3-5-flowered, the flowers borne on pedicels ca. 1 mm long; outer bract ca. 2-3 mm long, broadly ovate to suborbicular, obtusish, broadly scarious-margined, glabrous; first inner bract similar but 2 1/2-3 times as long, strongly concave and enclosing some or all flowers, with

a very broad lemon-yellow scarious margin, glabrous or very rarely pubescent (var. *pubescens* Lincz.); other inner bracts (one per flower) slightly smaller (the smallest outermost bract about equaling the outer bract), scarious, with a very narrow midrib terminating below the summit or nerveless; calyx 9-12 mm long, broadly funnelform, the tube obconical, ca. 4-5 mm long, densely covered throughout with rather long hairs on the nerves and between them; calyx limb ca. 5-7 mm broad, lemon-yellow, 5- or 10-lobed, the primary lobes large triangular-ovate obtusish or slightly acuminate, the rather short-pubescent nerves reaching the margin, the intermediate lobes small rounded nerveless, or absent and then the limb subtruncate at the interspaces between the primary lobes; petals orange-yellow. Fl. June; fr. July (Plate XXI, Figures 4, 4a).

Stony, mostly limestone or marl slopes in low mountains. — W. Siberia: Irt. (approximately south of the line Atbasar-Akmolinsk-Semipalatinsk), Alt. (left bank of the Irtys R.); Soviet Central Asia: Ar.-Casp. (Karsakpai area), Balkh. (N. half), Dzu.-Tarb. (Saur Range). Endemic? Described from Mt. Bishtas in the vicinity of Ayaguz. Type in Leningrad.

11. **L. Semenovii** (Herd.) Ktze. Rev. gen. II (1891) 396. — *Statice Semenowi* Herd. in Bull. Soc. Nat. Mosc. XLI (1868) 398 (Enum. pl. Semen. No. 888); Fedch. O. and B. Perech. rast. Turk. V, 185; M. Popov, Fl. Almat. zapovedn. 37.

Perennial, 10-25 (40) cm tall; taproot stout, woody; caudex strongly thickened, many-headed, stocky, rather densely clothed in remnants of leaf petioles and large membranous scales; leaves all radical, fairly numerous, 433 cineraceous-green, linear-lanceolate to oblong-spatulate, 1-1.5 (2.5) cm long and 0.2-0.4 cm broad, gradually acuminate or round-tipped, mucronate or muticous, gradually tapering at base into and about equaling the flat petiole; scapes 10-25, erect or the lateral ones slightly ascending, terete below, slightly angled upward, smooth (not verrucose), gently-flexuous, often nearly straight, simply branched; sterile branches arising in approximate fascicles of 3-5 from numerous nodes of the main inflorescence axis, straight or nearly so, simple, much longer than the subtending rather large triangular-lanceolate scales; spikes ca. 1.5-2 cm long, compactly 5-10-spiculed, capitately clustered in twos or threes or solitary at the ends of scapes; spicules 2-5 (10)-flowered, the flowers borne on pedicels ca. 1-1.5 mm long; outer bract 2-4 mm long, broadly ovate to suborbicular, obtusish or short-acuminate, broadly scarious-margined, densely covered with rather long hairs; first inner bract similar but 2-3 times as long, strongly concave and enclosing some or all flowers, with a very broad lemon-yellow membranous margin, densely covered with long hairs; rarely the outer and the first inner bract glabrous (var. *glabrum* Lincz.); other inner bracts (one per flower) slightly smaller (that of the outer flower smallest, about equaling the outer bract), scarious, the narrow midrib not reaching the summit; calyx (8) 9-11 mm long, broadly funnelform, the tube obconical, ca. 4-5 mm long, densely covered throughout with long hairs on and between the nerves; calyx limb 5-6 mm broad, lemon-yellow, 5-lobed, the lobes large, triangular-ovate, distinctly pointed, the nerves covered with rather short hairs, reaching the margin or slightly excurrent; petals orange-yellow. Fl. June-July; fr. July-August.

Stony slopes in low mountains. — Soviet Central Asia: Balkh. (low mountains on both sides of the Ili R. east of Iliisk [Ili]), Dzu.-Tarb.

(the "Dzungarian Gates" area). **Gen. distr.:** Dzu.-Kash. (E. Tien Shan, including the southern Kashgar slopes). Described from Katy mountains on the northern side of the Ili River. Type unknown (probably lost).

Note. 1) In view of the apparent loss of the type specimen collected by P. P. Semenov, we submit as neotype the specimen preserved in the Komarov Botanical Institute of the Academy of Sciences of the USSR and annotated "Trans-Ili Ala Tau. Charyn-Kurtoga River gorge. Stony slopes in the southern half of Turaigyr Mountains. 19 June 1937. M. G. Popov and V. P. Goloskokov" — thus collected fairly near the classical location.

2) The species closely related to *L. Semenovii* and described from Sinkiang (Lake Sairam area and Borotala River basin) but not so far
434 authenticated in the USSR — *L. chrysocephalum* (Rgl.) Lincz. comb. n. (*Statice chrysocephala* Rgl. in Tr. Bot. Sada, VI, 2 (1880) 383, 384, in note) and *L. sedoides* (Rgl.) Ktze. Rev. gen. II (1891) 396 (*Statice sedoides* Rgl. l. c. 384 (and in note)) — are characteristic and apparently mountain-desert forms, distinguishable by the lower growth (*L. sedoides* not exceeding 2-6 cm in height), smaller spikes and flowers, and the strong reduction of the sterile scape branches, these in the case of *L. chrysocephalum* not more than twice the length of the subtending membranous scales, and in *L. sedoides* even completely concealed by the scales.

Series 6. **Reznitzenkoana** Lincz. — Petals orange-yellow; calyx limb lemon-yellow; scapes compoundly paniced; sterile branches numerous, solitary, with long straight secondary branches. Series type: *L. Reznitzenkoanum* Lincz.

12. ***L. Reniczenkoanum*** Lincz. sp. n. in Addenda XVII, 747.

Perennial, ca. 40 cm tall; taproot stout, woody; caudex many-headed, short-branched, rather densely clothed in remnants of leaf petioles; leaves all radical, fairly numerous, cinerous-green, narrowly oblong-spatulate, 3-6 cm long and 0.4-0.6 cm broad, gradually acuminate or more or less rounded at apex, mucronulate, tapering at base into and one-third to half as long as the flat petiole; scapes 10-12, erect, terete below, slightly angled upward, gently flexuous to nearly straight, compoundly paniced nearly from base; sterile branches numerous, solitary, rather long and mostly secondarily branched, subtended by very small herbaceous-membranous scales; spikes ca. 1.5 cm long, compactly 5-7 spiculed, capitately clustered in twos or threes at the ends of main scape branches; spicules 2-4-flowered, borne on pedicels ca. 1 mm long; outer bract ca. 3-4 mm long, broadly ovate to suborbicular, obtusish, sometimes minutely mucronulate, broadly scarious-margined, glabrous; first inner bract similar but 2-2 1/2 times as long, strongly concave and enclosing the flowers, with a very broad lemon-yellow membranous margin, glabrous; other inner bracts (one per flower) slightly smaller, scarious, the narrow midrib not reaching the summit; calyx ca. 10 mm long, broadly funnelform, the tube obconical, ca. 5 mm long, densely covered throughout with rather long
435 hairs on and between the nerves; calyx limb ca. 5 mm broad, lemon-yellow, 10-lobed, the primary lobes large, triangular-ovate, acuminate, the nerves reaching the margin or scarcely excurrent, covered with short hairs in lower part, the intermediate lobes small, obtusish or acutish, nerveless; petals orange-yellow. Fl. July.

Stony slopes. — Soviet Central Asia: Dzu.-Tarb. (Saur Range). Endemic? Described from the Saur Range (E. mountain slopes near the confluence of the Oi-Karagai and Aba rivers). Type in Leningrad.

Note. A very characteristic plant, apparently related to *L. Klement-zii* Ik.-Gal. known from the Mongolian Ala Tau and the Kobdosskaya depression; distinguishable by the taller growth, nearly straight scapes and straight or nearly straight sterile branches, longer narrow and long-petioled leaves, and glabrous bracts. The early statement concerning the kinship (or even identity) of this plant with the enigmatic *L. ochranthum* (Kar. et Kir.) Ktze. (*Statice ochrantha* Kar. et Kir. in Bull. Soc. Nat. Mosc. XIV (1841) 730 (Enum. pl. alt., No. 728)), described from Tarbagatai, must obviously be rejected, since it is clear from the original description of Karelin and Kirilov (and it is pointed out by the authors themselves) that "*L. ochranthum* is very closely related to *Gonio-limon speciosum* (L.) Boiss.; it is possible that it is merely one of its minor forms (we do not unfortunately know the type of "*L. dichro-anthum*" and this species was described from specimens that were only just coming into flower).

Series 7. **Aurea** Lincz. — Petals orange-yellow; calyx limb golden-yellow; scapes compoundly paniced; sterile branches numerous, solitary, rather strongly secondarily branched, strongly flexuous or recurved. Series type: *L. aureum* (L.) Hill.

13. ***L. aureum*** (L.) Hill ex Ktze. Rev. gen. II (1891) 395*—*Statice aurea* L. Sp. pl. (1753) 276; Ldb. Fl. Ross. III, 458; Boiss. in DC. Prodr. XII, 641; Turcz. in Bull. Soc. Nat. Mosc. XXV, 3 (1852) 396 (Fl. baic.-dah. No. 928). — Ic.: Amman, Ruth. tab. 18, f. 2; Rchb. Pl. crit. II, tab. 195.

Perennial, 10-30 cm tall, glabrous throughout except calyx; taproot mostly fairly slender; caudex distinctly thick, many-headed; leaves all radical but soon withering and falling off, cineraceous-green, oblong-spatulate to sub lanceolate, 1-3 (5) cm long and 0.2-0.5 (1) cm broad, round-
36 tipped or slightly acuminate, occasionally mucronate, tapering at base into and longer than or about as long as the flat petiole; scapes 5-20, more or less ascending or upright, subterete, commonly minutely and densely verrucose, strongly flexuous, compoundly paniced nearly from base; sterile branches nearly always numerous, secondarily branched, strongly flexuous or recurved; spikes ca. 1 cm long, rather compactly 3-5 (7)-spiculed, in subcorymbose clusters at the ends of the upper mostly short scape branches; spicules (2) 3-5-flowered; outer bract ca. 1.5-2 mm long, broadly ovate, obtusish, broadly scarious-margined, glabrous; first inner bract similar but 2 1/2-3 times as long, strongly concave and enclosing some of the flowers, very broadly scarious-margined, glabrous; other inner bracts (one per flower) slightly smaller, scarious, the narrow midrib not reaching the summit; calyx 4.5-6 mm long, broadly funnelform, the tube obconical, ca. 2.5-3 mm long and 1 mm in diameter, rather densely covered the whole length or only in lower part with fairly long hairs on the nerves or also between them; calyx limb ca. 2-3 mm broad, golden-yellow,

* We have not seen Hill's publication in which this combination is presented; the combination does not appear in "Index kewensis".

5-lobed, the lobes broadly rounded-triangular, the nerves reaching the margin or slightly excurrent and mostly sparsely covered with short hairs; petals orange-yellow. Fl. June-August; fr. July-August.

Saline soils, solonchaks on the shores of brackish lakes, and in *Lastragrostis splendens* stands. — E. Siberia: Ang.-Say. (Tuva Autonomous Region, S. part), Dau. **Gen. distr.:** Mong. Described from "Dauria". Type in London.

Section 3. **LIMONIUM** Boiss. in DC. Prodr. XII (1848) 643 et Fl. or. IV (1879) 856. — *Eulimonium* Pax in Engl. — Pr. Pflanzenf. IV, 1 (1891) 125. — Scapes terete; calyx obconical or narrowly (rarely fairly broadly) funnelform, with a narrow limb, slightly oblique to nearly straight at base. Perennial plants.

14. **L. Gmelinii** (Willd.) Ktze. Rev. gen. II (1891) 395; Salmon in Journ. of Bot. XLVII (1909) 287, p.p. excl. f. *laxiflorum* et var. *Meyeri* Salmon; Stankov, Opred. rast. Evrop. ch. SSSR, 741. — *Statice Gmelini* Willd. Sp. pl. I (1797) 1524; Turcz. in Bull. Soc. Nat. Mosc. XXV, 3 (1852) 397 (Fl. baic.-dah. No. 929); Korsh. in Mem. Acad. Sc. Petersb. VIII ser. VII, 1, 346; Fedch. O. and B. Perech. rast. Turk. V, 181; Kazakevich in Zhurn. opyt. agron. Yugo-Vost. VII, 1, 127; Leisle in Fl. Yugo-Vost. VI, 41; Kryl. Fl. Zap. Sib. IX, 2154. — *S. Gmelini* α . *genuina* Boiss. in DC. Prodr. XII (1848) 645 et Fl. or. IV (1879) 859; Ldb. Fl. Ross. III, 460; Kuzn. in Mat. dlya Fl. Kavk. IV, 1, 210. —
- 437 *S. Gmelinii* var. α . *typica* Trautv. in Bull. Acad. Sc. Petersb. XIV (1856) 252. — *S. Gmelini* a. *scoparia* Schmalh. Fl. II (1897) 191. — *S. Gmelini* ssp. *genuina* Wangerin in Zeitschr. für Naturwissensch. LXXXII (1912) 441. — *S. scoparia* Pall. ex Willd. Sp. pl. I (1797) 1524. — *S. glauca* Willd. ex Schult. Syst. veg. VI (1820) 799. — Ic.: Gmel. Fl. sib. II (1749) tab. 90; Rchb. Pl. crit. III (1825) tab. 236 (sub *Statice scoparia* Pall.); Rchb. Ic. Fl. Germ. XVII (1855) tab. 1141, f. 2; Lafont in Act. Soc. Linn. Bordeaux, XXVII (1869) tab. 9, f. 8; Maevskii, Fl. sp. Rossii, ed. 5, Fig. 175; Larin, Korm. rast. estestv. senokosov i pastb. SSSR (1937), Fig. 652; Pavlov, Dikie polezn. itekhnich. rasteniya SSSR (1942), Fig. 116.

Perennial, 30-60 (80) cm tall, glabrous throughout except calyx; taproot stout; caudex rather strongly thickened, commonly with few short branches; leaves all radical, fairly numerous, pale green or glaucous-green, subovate to rather broadly elliptic or oblong-obovate, (5) 15-25 (40) cm long and (3) 5-8 (10) cm broad, obtuse, more or less rounded or pointed at apex, rather gradually tapering at base into and a quarter to half as long as the fairly broad flattish petiole; scapes few, terete, in upper half or two thirds compoundly but mostly not very strongly panicked; sterile branches none or few; scales rather large, especially in lower part; spikes rather short and compact, rather densely clustered on the short terminal scape branches, forming a rather contracted subcorymbose or pyramidal inflorescence; spicules small, ca. 5 mm long, (1) 2-3 (4)-flowered; outer bract ca. 1-1.5 mm long, broadly ovate to suborbicular, short acuminate or obtusish, rather broadly scarious-margined; first inner bract similar but 2-3 times as long, strongly concave and partly enclosing the flowers, obtuse, round-tipped or subtruncate, broadly scarious-margined; other inner bracts (one per flower; the first of these displaced and inserted just

behind the outer bract) somewhat smaller, scarious, with a narrow midrib; calyx ca. 3-4 mm long, obconical, the tube 2-2.5 mm long and 1 mm in diameter, densely covered on the nerves (mostly only on the two inner ones) at the very base and in lower part or the whole length with fairly long hairs; calyx limb ca. 1-1.5 mm broad, pale violet or whitish, 5- or 10-lobed, the primary lobes very small (at most ca. 0.5 mm long), rounded-triangular, obtusish or acutish, the nerves terminating slightly below their base, the intermediate lobes, when present, still smaller; petals bluish-violet. Fl. July-September.

438 Saline meadows, wet solonchaks, shores of brackish lakes, seacoasts, saline depressions, and river valleys. — European part: V.-Don (extreme S.), Transv., Bes., Bl., ? Crimea, L. Don, L.V.; W. Siberia: Ob (extreme S.), U. Tob., Irt., Alt. (SW); E. Siberia: Ang.-Say.; Soviet Central Asia: Ar.-Casp., Balkh., Kyz. K., Syr D., T. Sh. (Centr. part, saline sites in river valleys). **Gen. distr.:** Centr. Eur. (SE), Dzu.-Kash (N.), Mong. (W. - lake depressions). Described from "Siberia" ("a Jaico ad Angaram usque"). Type in Berlin (in Willdenow's herbarium).

Note. The section *Limonium*, and more particularly the cycle of species affiliated to East European and Asian *L. Gmelinii* (Willd.) Ktze. and West European *L. vulgare* Mill. (*Statice Limonium* L.) belong, as evident from the synonymy, to systematically very confused groups. This cycle consists of a large number of minor forms which owe their derivation, on the one hand, to the great complexity of habitats (different degrees of salinity which vary abruptly within small areas) and, on the other hand, possibly to interhybridization, while the possibility of participation in this process of certain other forms occurring in the same regions (especially in southern areas of the European part of the USSR) cannot be excluded. The characters of the forms of this cycle are rather indefinite, elusive, and transient, and this accounts for the great differences in their treatment. They are classified both as distinct species and as forms of the lowest taxonomic order. The group of forms of *L. Gmelinii* (Willd.) Ktze. affiliation, occurring in the USSR, has been considered by most of the older as well as by recent authors (Trautvetter, Schmalhausen, Boissier, Kuznetsov, Salmon, Wangerin) as a composite species, in which, for instance, Trautvetter includes 4 varieties and 5 forms, and Wangerin — 3 subspecies and 4 varieties.

In recent times, the systematics of this groups was studied by M. V. Klovov who is known to favor assignation of specific identity to forms of very low standing. The results of his investigations have so far been only partly published, and that in a short and provisional manner (Viznachnik roslin URSR [Conspectus of Plants of the USSR], 1950), and therefore could not be used here. We are deeply convinced that this group needs study on very extensive material and field work over the entire distribution area; otherwise the systematics of this group can hardly be satisfactorily elucidated. In view of the confused position of this group, this need is probably even greater than it appears from the present account.

439 Having as our object in the present work to render accessible the determination of at least the principal forms of this cycle, we present them with a rather wide scope, adopting as a basis such characters as the vesture of various plants parts (except calyx), the presence or absence of sterile inflorescence branches, and the type of inflorescence branching (more or less contracted and corymbose or loosely paniculate). These characters enable a more or less clear distinction between *L. Gmelinii* (Willd.)

Ktze., *L. Meyeri* (Boiss.) Ktze., and *L. tomentellum* (Boiss.) Ktze. The presentation of other, less distinctive forms, while their study is in progress, does not seem to be justified.

15. *L. Meyeri* (Boiss.) Ktze. Rev. gen. II (1891) 395; Grossg. Oprod. rast. Kavk. 594.—*L. Gmelini* f. *laxiflorum* et var. *Meyeri* Salmon in Journ. of Bot. XLVII (1909) 288.—*L. obovatum* Ktze. l.c. 395.—*L. tanaiticum* Gamajun. in Izv. Kazakhst. fil. AN SSSR, 1 (1944) 9, nomen.—*L. scoparium* Klok. in Grossg. Oprod. rast. Kavk. (1949) 594.—*L. scoparium* Stank. Oprod. rast. Evrop. ch. SSSR (1949) 741.—*Statice Meyeri* Boiss. in DC. Prodr. XII (1848) 645; Ldb. Fl. Ross. III, 460; Grossg. Fl. Kavk. ed. 1, III, 220 (incl. *salina* et var. *umbrosa* Grossh.); Chernova in Tr. prikl. bot., gen. i sel. ser. X, 1, 156; Klok. in Vizn. rosl. URSR, 708.—*S. Gmelini* var. *γ. laxiflora* Boiss. in DC. Prodr. XII (1848) 646 et Fl. or. IV (1879) 859; Ldb. Fl. Ross. III, 461; Shmal'g. Fl. II, 191; Kuzn. in Mat. Fl. Kavk. IV, 1, 213; Chernova, l.c., 157.—*S. laxiflora* Novopokr. in Izv. Glavn. Bot. Sada XXX (1932) 239, in observ.—*S. scoparia* M.B. Fl. taur.-cauc. I (1808) 249, non Pall. ex Willd.—*S. Gmelini* var. *β. scoparia* Trautv. in Bull. Acad. Sc. Petersb. XIV (1856) 263, p.p. excl. syn. Pall. et Schult.—*S. Gmelini* ssp. *scoparia* Wangerin in Zeitschr. für Naturwissensch. LXXXII (1912) 442, p.p. excl. syn. Pall. ex Willd. et ? var. *limonioides* Wangerin.—*S. Gmelini* var. *grandis* M. Pop. ex Andross. in Tr. Turkmensk. bot. sada, I (1941) 52.—*S. obovata* Ldb. Fl. Ross. III (1849-1849) 468; Boiss. Fl. or. IV, 866, 1199; Kuzn. in Mat. Fl. Kavk. IV, 1, 221; Grossg. Fl. Kavk. ed. 1, III, 218.—? *S. oblongifolia* Kotov. in Tr. Sil's'ko-gospod. komit. bot. I, 3 (1927) 165.—Exs.: Herb. Fl. Cauc. No. 95; Pl. or. exs. No. 314; Sint. It. transcasp.-pers. 1900-1901, No. 1307.

Perennial, 40-80 (150) cm tall, glabrous throughout except calyx; taproot stout; caudex rather strongly thickened, mostly with few short branches; leaves all radical, fairly numerous, pale green or glaucous-green, subovate to rather broadly elliptic or oblong-obovate, (5) 15-25 (40) cm long and (3) 5-8 (12) cm broad, obtuse, round-tipped or more or less pointed, rather gradually tapering at base and equaling to 2-4 times as long as the rather broad flattish petiole; scapes few, terete, sometimes nearly from base but mostly in upper half or two thirds compoundly and strongly paniced; sterile branches absent or few or rarely fairly numerous; 440 scales fairly large, especially in lower part; spikes commonly short and loose, subremote on short terminal scape branches, forming a spreading loosely paniced inflorescence; spicules ca. 5 mm long, (1) 2-3 (4)-flowered; outer bract ca. 1-1.5 mm long, broadly ovate to suborbicular, short-acuminate or obtusish, rather broadly scarious-margined; first inner bract similar but 2-3 times as long, strongly concave and partly enclosing the flowers, obtuse, round-tipped to subtruncate, broadly scarious-margined; other inner bracts (one per flower; the first displaced and inserted just behind the outer bract), slightly smaller, scarious, with a narrow midrib; calyx ca. 3.5-4.5 mm long, obconical, the tube ca. 2.5-3 mm long and 1 mm in diameter, densely covered at the base and on lower half or whole length of the nerves with fairly long hairs; calyx limb ca. 1-1.5 mm broad, pale violet or whitish, 5- or 10-lobed, the primary lobes very short (not exceeding ca. 0.5 mm), rounded-triangular, obtusish

or acutish, the nerves not quite reaching the base of lobes, the intermediate lobes still shorter and nerveless; petals bluish-violet. Fl. July-September.

Saline meadows, more rarely wet solonchaks, shores of brackish lakes, seacoasts, saline depressions, and river valleys.—European part: Bl., Crim., L. Don (S.), L. V. (S.); Caucasus: Dag., E. and S. Transc., Tal.; Soviet Central Asia: Ar.-Casp., Balkh., Kyz. K., Kara K., Amu D., Syr D. **Gen. distr.:** Bal.-As. Min., Iran. Described from the Crimea and the Caucasus. Type in Geneva; paratype in Leningrad.

Note. A critical, though recently rehabilitated, species requiring further study with a view to establishing clear-cut morphological differences from the typical form of *L. Gmelinii* and precise delimitation of the distribution area. For the time being, the only characteristics which distinguish *L. Meyeri* from the typical form of *L. Gmelinii* are the more open loosely paniculate inflorescence, the taller average growth, and the more southerly distribution, which is not always enough to guarantee reliable determination.

Statice obovata Ldb., which was described by Lenkoran from a single imperfect and underdeveloped specimen, characterized by the presence of small leaves on the lower nodes of the inflorescence (occasionally observable also in other species of the cycle), apparently represents a teratological form of *L. Meyeri*.

16. ***L. tomentellum*** (Boiss.) Ktze. Rev. gen. II (1891) 396; Salmon in Journ. of Bot. XLIX (1911) 75; Gams in Hegl. Ill. Fl. V, 3, 1880, in observ.; Grossg. Opred. rast. Kavk. 594; Stankov, Opred. rast. Evrop. in SSSR, 739.—? *L. alutaceum* Ktze. l.c. 396.—*L. dubium* Gamajun. in Izv. Kazakhst. fil. AN SSSR, 1 (1944) 9, nomen.—*Statice tomentella* Boiss. in DC. Prodr. XII (1848) 645; Ldb. Fl. Ross. III, 461; Keller, V obl. polupustyni, II, 121; Fedch. O. and B. Perech. rast. Turk. V, 182; Kazakevich in Zhurn. opyt. agron. Yugo-Vost. VII, 1, 122; Grossg. Fl. Kavk. ed. 1, III, 220; Leisle in Fl. Yugo-Vost. VI (1936) 40 (incl. var. *patens* et var. *stepposa* Leisle).—*S. Gmelini* var. ***δ. tomentella*** (incl. f. *trachycaulis*, an p.p. et ? f. *glabella*) Trautv. in Bull. Acad. Sc. Petersb. XIV (1856) 255; Shmal'g. Fl. II, 191; Kuzn. in Mat. dlya Fl. Kavk. IV, 1, 215.—*S. Gmelini* ssp. *tomentella* (incl. var. *typica* et ? var. *subglabra*) Wangerin in Zeitsch. für Naturwissensch. LXXXII (1912) 443.—*S. Gmelini* M.B. Fl. taur.-cauc. I (1808) 250 et. Schult. Syst. veg. VI (1820) 778, non Willd.—? *S. alutacea* Stev. in Bull. Soc. Nat. Mosc. XXX, 2 (1857) 367; Klok. in Vizn. rosl. URSS, 708.—? *S. donetzica* Klok. l.c. 708.—? *S. hypanica* Klok. l.c. 708, an p.p.—? *S. czurjukiensis* Klok. l.c. 708.—Ic.: Salmon, l.c. tab. 511, f. 1-3; Kazakevich, l.c., Fig. 5.—Exs.: GRF, No. 1588a, b; Novopokr. Gerb. donsk. fl. No. 43 (sub *S. Gmelini*); Gerb. Ukr. fl. No. 84.

Perennial, 30-80 cm tall, hairy throughout or partly, densely or rather sparsely, the simple hairs mostly interspersed with a varying amount of tufted hairs; taproot stout; caudex rather strongly thickened, commonly with few short branches; leaves all radical, fairly numerous, usually pale green or glaucescent-green, subovate to rather broadly elliptic or obovate, 5-15 (25) cm long and 3-7 (9) cm broad, obtuse, round-tipped or sometimes short-mucronate, gradually tapering at base and always distinctly (sometimes considerably) longer than the rather broad flat petiole, covered

on both sides with short hairs, ciliate-margined, to glabrate or glabrous; scapes few, terete, in upper half or two thirds compoundly paniced; sterile branches none or rarely very few, densely velutinous-pubescent to glabrate; scales commonly large, up to 3-5 cm long at the lower nodes, brown; spikes fairly short and compact, rather densely and often subcapitately clustered on terminal scape branches; spicules 4-5 mm long, (1) 2-3 (4)-flowered; outer bract ca. 1-2 mm long, broadly ovate to suborbicular, short-acuminate or obtusish, rather broadly scarious-margined, sparsely pubescent or glabrous; first inner bract similar but 442 2-3 times as long, strongly concave and partly enclosing the flowers, obtuse, round-tipped or subtruncate, broadly scarious-margined, pubescent or sometimes glabrous; other inner bracts (one per flower; the first displaced and inserted just behind the outer bract) slightly smaller, scarious, the narrow midrib pubescent or bare; calyx ca. 3.5-5 mm long, obconical, the tube ca. 2.5-3.5 mm long and 1 mm in diameter, densely covered with rather long hairs throughout or merely on the nerves; calyx limb ca. 1-1.5 mm broad, pale violet or whitish, more or less distinctly 10-lobed, the primary lobes very small (not exceeding 0.5 mm in length), rounded-triangular, obtusish or acutish, the nerves nearly reaching the base of lobes, the intermediate lobes still smaller; petals bluish-violet. Fl. July-September.

Saline meadows, more rarely wet solonchaks, shores of brackish lakes, saline depressions (columnar solonchaks), and river valleys. — European part: Transv. (SW), ? Bes., Bl., Crimea (Sivash area), L. Don, L. V. Endemic. Described from plants collected by Claus in the Lower Volga region. Type in Geneva.

Note. *L. tomentellum* (Boiss.) Ktze. has been made here to include all the more or less hairy forms (calyx excluded) of *L. Gmelinii* s.l., which renders the scope of *L. tomentellum* rather wide. Unfortunately, the recently published results of the studies carried out by M.V. Klovov (ibid.) on the South Ukrainian forms of this cycle could not be taken here into account, because of the insufficiency of data supplied by the author.

17. *L. latifolium* (Sm.) Ktze. Rev. gen. II (1891) 395; Grossg. Opred. rast. Kavk. 594. — *Statice latifolia* Sm. in Trans. Linn. soc. I (1791) 250; Willd. Sp. pl. I, 1524; Boiss. in DC. Prodr. XII, 660; Ldb. Fl. Ross. III, 461; Boiss. Fl. or. IV, 864; Shmal'g. Fl. II, 191; Kuzn. in Mat. Fl. Kavk. IV, 1, 217; Keller, V obl. polupustyni, II, 121; Fedch. O. and B. Perech. rast. Turk. V, 182; Kazakevich in Zhurn. opyt. agron. Yugo-Vost. VII, 1 (1929) 123; Grossg. Fl. Kavk. ed. 1, III, 219; Chernova in Tr. prikl. bot., gen. i sel. ser. X, 1, 155; Leisle in Fl. Yugo-Vost. VI, 40; Pavlov, Rastit. syr'e Kazakhst. 399; Klok in Vizn. rosl. URSS, 707. — *S. coriaria* Pall. Tabl. Taur. (1795) 49, nomen et ex M.B. Fl. taur.-cauc. I (1808) 249, III (1819) 252. — Ic.: G. F. Hoffm. in Commentat. Soc. Sc. Goetting. XII, tab. 1 (sub *S. coriaria*); Rchb. Pl. crit. III, tab. 291; Rev. Hortic. (1904) 231, f. 89; Kazakevich, l.c., Fig. 3. — Exs.: Novopokr. Gerb. donsk. fl. No. 144; Herb. Fl. Cauc. No. 442.
- 445 Perennial, 50-100 cm tall, rather densely and sometimes subvelutinosely hairy throughout or nearly so (especially on the leaves and the lower part of scapes), the hairs soft and nearly always tufted; taproot more or less thickened, long, subcylindrical; caudex not thickened or only slightly thickened at the top, simple or with few short branches at ground level;

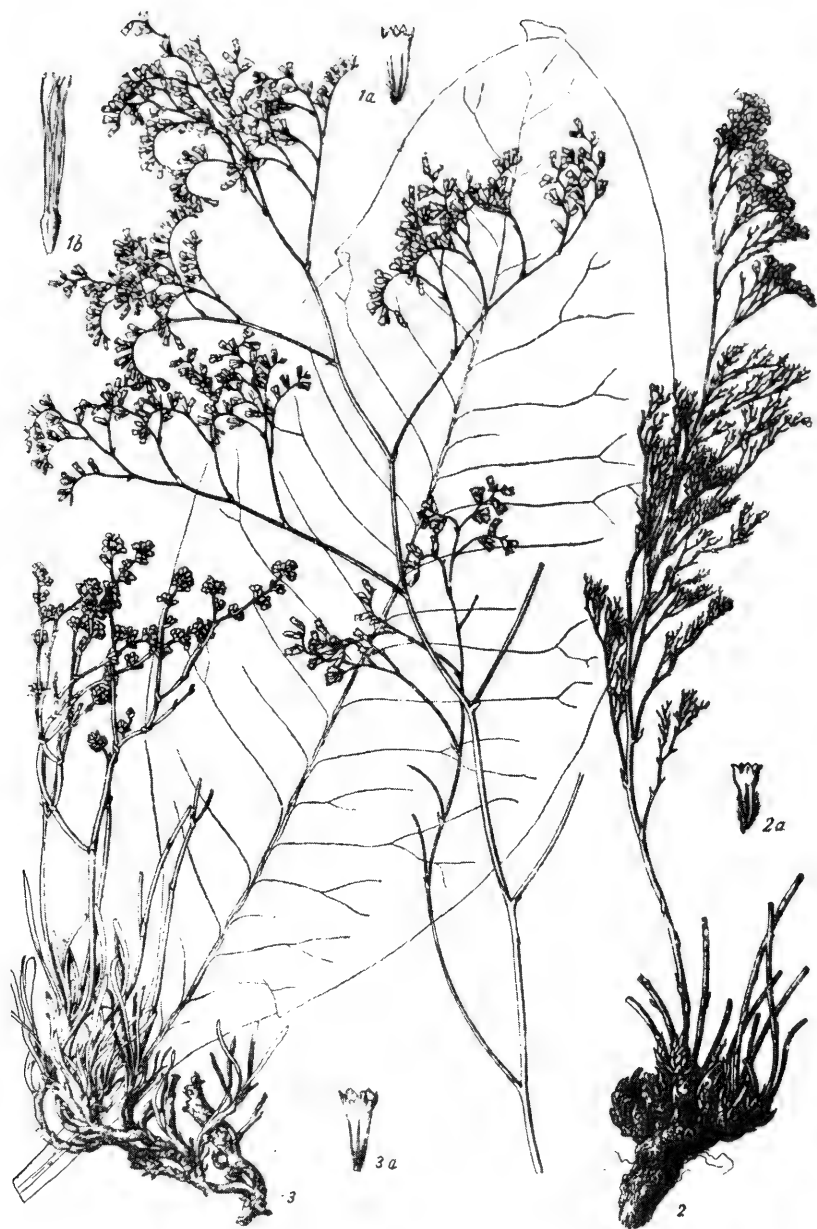


Plate XXII

1. *Limonium latifolium* (Sm.) Ktze., part of inflorescence and leaf, 1a) calyx, 1b) ovary.—
 2. *L. corralloides* (Tausch.) Luncz., 2a) calyx.— 3. *L. suffruticosum* (L.) Ktze., 3a) calyx.

leaves all radical, few, pale green, oblong-elliptic to suborbicular-elliptic, (15) 30-60 cm long and (4) 8-15 cm broad, mostly obtuse, round-tipped to scarcely emarginate, gradually tapering at base into the petiole, this narrow and long, often about equaling the blade; scapes few, terete, in upper part to two thirds compoundly and slenderly paniced; sterile branches commonly very few or none; spikes oblong, loose, borne on very numerous slender scape branches, forming a large, paniculate subspherical inflorescence; spicules ca. 3-4 mm long, 1-2 (3)-flowered; outer bract ca. 1 mm long, broadly ovate, obtuse or short-acuminate, broadly scarious-margined, glabrous; first inner bract similar but about twice as long, strongly concave and enclosing the flowers, obtuse to subtruncate, very broadly scarious-margined, glabrous; other inner bracts (one per flower; the first displaced and inserted just behind the outer bract) much smaller, scarious, with or without a narrow midrib; calyx ca. 3-3.5 mm long, obconical, the tube ca. 1.5 mm long and 1 mm in diameter, glabrous or in lower part irregularly (mostly on one side) pubescent on the nerves; calyx limb ca. 1.5 mm broad, white, 5- or indistinctly 10-lobed, the primary lobes small (ca. 0.5 mm long), more or less rounded-triangular, obtusish to acutish, the bare nerves not quite reaching the base of the lobes, the intermediate nerves minute or absent; petals bluish-violet. Fl. July-October (Plate XXII, Figures 1, 1a, 1b).

Steppe associations, from the forest-steppe to the semidesert zones (in the latter in steppe-like depressions). — European part: V.-Don (extreme S.), Bes., Bl., Crim., L. Don, L. V. (W.); Caucasus: Cisc., Dag., W. Transc. (Novorossiisk area). **Gen. distr.:** Bal.-As. Min. (Rumania, Bulgaria), ? Arm.-Kurd. (Lake Rizaieh area (formerly Urmia), ? Iran. (part adjacent to the Caspian). Described from plants collected by Gerber in the Don River valley in the Azov area. Type in London.

446 **Note.** This species does not appear to extend eastward far beyond the Volga, and reports concerning its occurrence in the Ural region and, more particularly, in the Aktyubinsk and Kustanai regions of Kazakhstan, need confirmation. In any case (disregarding the collections from Mount Bogdo, not far east of the Volga), I have not seen a single reliable herbarium specimen from these regions. It is possible that all these reports refer to the related species *L. sareptanum* (Becker) Gams. Neither have I seen any material from Iran, where this species is reported in Parsa's "Flora of Iran" (Parsa, *Flore de l'Iran*, IV, 2 (1950) 932).

Economic importance. As regards tannin content, the best of all sea-lavenders for tanning purposes; for data concerning this point see section dealing with economic importance of the genus, page 305.

18. *L. sareptanum* (Becker) Gams in Hegi, *Ill. Fl.* V, 3 (1927) 1880; Gamayunova in *Izv. Kazakhst. fil. AN SSSR*, 1 (1944) 10; Stankov, *Opred. rast. Evrop. ch. SSSR*, 740. — *L. tomentellum* var. *sareptanum* Salmon in *Journ. of Bot.* XLIX (1911) 76. — *Statice sareptana* Becker in *Bul. Soc. Nat. Mosc.* XXX, 1 (1858) 12, 60; Keller, *V obl. polupustyni*, II, 121; Wangerin in *Zeitsch. für Naturwissensch.* LXXXII, 443; Kazakevich in *Zhurn. opytn. agron. Yugo-Vost.* VII, 1 (1929) 122; Chernova in *Tr. prikl. bot., gen. i sel. ser. X*, 1 (1933) 154; Leisle in *Fl. Yugo-Vost.* VI, 40; Kryl. *Fl. Zap. Sib.* IX, 2156; Klok. in *Vizn. rosl. URSR*, 707. — *S. intermedia* Czern. *Konsp. rast. okr. Khar'kova* (1859) 51, nomen; Shmal'g. *Fl.* II, 191. — *S. tomentella* ssp. *sareptana* Nym. *Consp.*

Fl. Europ. (1881) 609.—*S. latifolia* Korsh. in Mem. Acad. Petersb. VIII ser. VII, 1 (1898) 546 (Tentamen Fl. Ross. or. No. 1037), non Sm.—*S. Gmelini* × *latifolia* Kuzn. Mat. Fl. Kavk. IV, 1 (1903) 215.—? *S. maeotica* Klok. l.c. 707.—Ic.: Rchb. Pl. crit. III, tab. 237; Lafont. in Act. Soc. Linn. Bordeaux, XXVII, tab. 9, f. 12; Salmon, l.c. tab. 511, f. 4; Kazakevich, l.c., Fig. 2; Chernova, l.c. Fig. 4, f. 2.

Perennial, 20-60 (80) cm tall, densely or fairly loosely hairy throughout or in parts, the hairs solitary interspersed with tufted hairs; root rather slender; caudex slightly thickened, simple or with few short branches; leaves all radical, few, hairy throughout or partly, sometimes merely on the lower part of the midrib, pale green or glaucescent-green, rather broadly elliptic to obovate, 5-15 (25) cm long and 2-5 (8) cm broad, obtuse, round-tipped or sometimes scarcely emarginate, tapering at base into and from equaling to markedly exceeding the rather narrow petiole; scapes few, terete, in lower half or two thirds or sometimes nearly from base compoundly and slenderly branched; sterile branches rather numerous, hairy throughout or merely in lower part; spikes suboblong, loose, borne on slender terminal scape branches, forming a spreading or sometimes subcorymbose (but not spherical) inflorescence; spicules ca. 5 mm long, (1) 2-3 (4)-flowered; outer bract ca. 1 mm long, broadly ovate to suborbicular, obtusish or short-acuminate, rather narrowly scarious-margined, glabrous, rarely scarcely and very rarely densely pubescent; first inner bract similar but about three times as long, strongly concave and partly enclosing the flowers, obtuse to subtruncate, broadly scarious-margined, sparsely or very rarely densely pubescent or glabrous; other inner bracts (one per flower; the first displaced and inserted just behind the outer bract) slightly smaller, scarious, narrow-nerved, glabrous or very rarely the outermost pubescent; calyx ca. 4-5 mm long, obconical or very narrowly funnelform, the tube ca. 3 mm long and 1 mm in diameter, irregularly (on one side only on the two inner nerves) or regularly (on all five nerves) covered with fairly long hairs; calyx limb ca. 1.5-2 mm broad, white, rather distinctly 5-lobed, the primary lobes small (0.5-1 mm long) rounded-triangular, obtusish to acutish, the bare or rarely pubescent nerves nearly reaching the base of lobes, the intermediate lobes much smaller; petals bluish violet. Fl. July-September.

Desert-steppe or semidesert (fescue and pyrethrum or wormwood) associations, in soils of relatively low salinity, chiefly in the southern part of the steppe belt.—European part: V.-Don (S.), Transv. (S.), Bl., Crim., L. Don, L. V.; W. Siberia: U. Tob., Irt. (SW); Soviet Central Asia: Ar.-Casp. (N.). Endemic. Described from the Lower Volga region (Krasnoarmeisk area — formerly Sarepta). Type in Leningrad.

Note. A species undoubtedly related to *L. latifolium* (Sm.) Ktze. and often confused with it, even though differing rather clearly in the lower average growth, much smaller leaves, less spreading (not spherical) inflorescence with fairly numerous sterile branches in its lower part, considerably larger flowers, and the generally much reduced vestiture consisting of simple hairs interspersed with mostly few tufted and commonly shorter hairs. Unlike *L. latifolium*, does not grow in typical steppe associations, but rather in associations with a more pronounced desert character (with wormwood or pyrethrum), and in this respect it differs also from *L. tomentellum* (Boiss.) Ktze. which is typically associated with saline meadows and solonchaks, and this apart from other differences.

It may be recalled that I. F. Schmalhausen and later N.I. Kuznetsov (ibid.) considered *L. sareptanum* as a hybrid between *L. latifolium* and *L. Gmelinii* s.l., while B. A. Keller (ibid.) was opposed to this view and pointed out that the distribution area of *L. sareptanum* is much more
448 extensive than that of one of the proposed parents (*L. latifolium*) and that *L. sareptanum* has a distinctive and clearly defined ecology. Keller further maintains that *L. sareptanum* does not display any pronounced polymorphism and that it is "premature" to regard it as a "hybrid race". The possibility that *L. sareptanum* may be a cross between *L. tomentellum* and *L. latifolium* is also suggested by Salmon (ibid. 75).

19. **L. Bungei** (Claus) Gamajun. in Izv. Kazakhst. fil. AN SSSR, 1 (1944) 10; Stankov, Opred. rast. Evrop. ch. SSSR, 740.—*Statice Bungei* Claus in Beitr. z. Pflanzenkunde d. Russ. Reiches, VIII (1851) 308; Wangerin in Zeitschr. für Naturwissensch. LXXXII (1912) 443; Kazakevich in Tr. Sarat. obshch. estestvoisp. X, 4 (1925) 16 and in Zhurn. opyt. agron. Yugo-Vost. VII, 1 (1929) 122; Leisle in Fl. Yugo-Vost. VI, 42.—*S. membranacea* Czern. Konsp. rast. okrestn. Khar'kova (1859) 51; Wangerin, l.c. 443; Klok. in Vizn. rosl. URSR, 707.—*S. Gmelini* var. *γ. steiroclada* Trautv. in Bull. Acad. Sc. Petersb. XIV (1856) 254.—*S. Gmelini* ssp. *genuina* var. *vulgaris* f. *steiroclada* Wangerin, l.c. 442.—*S. gracilis* Fisch. ex Boiss. in DC. Prodr. XII (1848) 660 et Ldb. Fl. Ross. III, 459, non Tineo ex Guss. 1845.

Perennial, 20-60 (80) cm tall, glabrous except calyx; taproot rather slender; caudex slightly thickened, simple or with few short branches; leaves all radical, few, pale green or glaucescent-green, rather broadly elliptic, sometimes to subovate, 5-15 (20) cm long and 2-5 (7) cm broad, obtuse, round-tipped or sometimes scarcely emarginate, tapering at base into and about equaling or markedly longer than the rather narrow petiole; scapes few, terete, in upper half to two thirds compoundly and slenderly panicled; sterile branches fairly numerous; spikes suboblong, loose, borne on slender terminal scape branches, forming a spreading sometimes subcorymbose (but not spherical) inflorescence; spicules ca. 5 mm long, (1) 2-3 (4)-flowered; outer bract ca. 1 mm long, broadly ovate to suborbicular, obtusish or short-acuminate, rather narrowly scarious-margined; first inner bract similar but about 3 times as long, strongly concave and partly enclosing the flowers, obtuse to subtruncate, broadly scarious-margined; other inner bracts (one per flower; the first displaced and inserted just behind the outer bract), slightly smaller, scarious, with a narrow midrib; calyx ca. 4-5 mm long, obconical or very narrowly funnelform, the tube ca. 3 mm long and 1 mm in diameter, irregularly hairy in lower part on the nerves (usually only on one side on the two inner
449 nerves); calyx limb ca. 1.5-2 mm broad, white (or faintly bluish?), more or less distinctly 10-lobed, the primary lobes small (0.5-1 mm long), rounded-triangular, obtusish or acutish, the bare nerves very nearly reaching the base of lobes, the intermediate lobes much smaller; petals bluish-violet. Fl. July-September.

Alkaline clay slopes (emersions of Jurassic clays of the Volga Upland), chalk outcrops, in steppe associations, sometimes in fallows.—European part: V.-Don. (extreme S., the part adjacent to the Volga), Bl., L. Don (N. half); ? W. Siberia: Irt. (part adjacent to the Altai, not confirmed by

recent collections). Endemic. Described from the Volga region (Saratov-Kamyshin area). Type in Leningrad.

Note. A species very closely related to *L. sareptanum* (Becker) Gams; distinguishable in dry state only by the complete absence of vestiture (except calyx) and sometimes (e.g., by Yu. S. Grigor'ev, in herb.) admitted merely as a variety of it. I have not succeeded in discerning any differences between this species and *Statice membranacea* Czern. described from the steppe part of the Ukraine by V. M. Chernyaev and recognized by M. V. Klovov (1950). Completely indistinguishable from *L. Bungei* and *Statice gracilis* Fisch. ex Boiss., described from plants collected by Mordovnik reportedly from the Altai (where he was in 1824), of which an original specimen is preserved in the herbarium of the Botanical Institute of the Academy of Sciences of the USSR. Already Trautvetter (1856), without knowing this specimen and merely on the basis of the description of *S. gracilis*, related it to his *S. Gmelini* var. γ . *steiroclada*, which has also been shown to be perfectly identical with *L. Bungei*. For the present, the Altaian origin of "*S. gracilis*" seems to this author dubious, considering that, beside the mentioned specimen with the label "*Mardofkin Altai*" there are to my knowledge no more recent collections of this species from the Altai or from any other area east of the Volga.

20. *L. caspium* (Willd.) Gams in Hegi, Ill. Fl. V. V, 3 (1927) 1880; Grossg. Opred. rast. Kavk. 594; Stankov, Opred. rast. Evrop. ch. SSSR, 739.—*Statice caspia* Willd. Enum. Hort. Berol. I (1809) 336, adn.; M. B. Fl. taur.-cauc. III, 253; Boiss. in DC. Prodr. XII, 660 (incl. β . *patens* Boiss.) et Fl. or. IV, 865; Ldb. Fl. Ross. III, 459; Shmal'g. Fl. II, 191; Lipskii, Fl. Kavk. 428 (incl. β . *kimmerica* Lipsky); Kuzn. in Mat. Fl. Kavk. IV, 1, 218; Fedch. O. and B. Perech. rast. Turk. 5, 181; Grossg. Fl. Kavk. ed. 1, III, 219; Chernova in Tr. prikl. bot., gen. i sel. ser. X, 1, 152; Leisle in Fl. Yugo-Vost. VI, 39; Kryl. Fl. Zap. Sib. IX, 2157; Klok. in Vizn. rosl. URSR, 707.—*S. reticulata* M. B. Fl. taur.-cauc. I (1808) 250 et auct. fl. ross. non L.—*S. patens* Fisch. ex Boiss. in DC. Prodr. XII (1848) 661, pro syn.—*S. caspia* var. *robusta* Lipsky ex Kusn. l. c. 219, pro syn. ad. var. *kimmerica* Lipsky.—Ic.: Gmel. Fl. sib. II, tab. 89, f. 2; Rchb. Pl. crit. II, tab. 194 et Ic. Fl. Germ. XVII, tab. 1142, f. 3; Larin, Korm. rast. estestv. senokosov i
450 pastb. SSSR, Fig. 651.—Exs.: Lang et Szov. Herb. ruth. No. 87; Callier, It. taur. 1900, No. 711; Dörf. Herb. norm. No. 4175; Fl. exs. Austro-Hung. Ni. 3820.

Perennial, 10-35 (50) cm tall, glabrous throughout except calyx; taproot often fairly stout; caudex rather strongly and sometimes subpherically thickened, short, many-headed; leaves mostly all radical (occasionally 1 or 2 at the lower nodes of scapes and then resembling in shape the radical leaves), numerous but at flowering time usually dying off completely or nearly so, glaucescent-green, obovate to oblong-spatulate, 2-6 cm long and 0.5-1.5 cm broad, obtuse, broadly round-tipped to scarcely emarginate or minutely pointed, very gradually tapering at base into and about equaling or markedly exceeding the flattish petiole; scapes numerous, commonly slender, erect or more or less ascending, terete, compoundly paniced nearly from base; sterile branches fairly numerous or sometimes very numerous, slender, secondarily branched, all rather densely (especially in upper part) and minutely verrucose; spikes small, fairly dense, clustered

on short terminal scape branches, forming a rather dense corymbose-paniculate inflorescence; spicules ca. 4-5 mm long, 2- or 3-flowered; outer bract ca. 1-2 mm long, broadly ovate, short-acuminate or obtusish, scarious except for the narrow midrib; first inner bract 2-3 times as long, strongly concave and partly enclosing the flowers, obtuse to subtruncate, broadly scarious-margined; other inner bracts (one per flower; the first displaced and inserted just behind the outer bract) much smaller, scarious; calyx ca. 3-4.5 mm long, obconical, the tube ca. 1.5-2 mm long and 0.5-1 mm in diameter, rather densely covered at base and on the nerves (sometimes only on the two inner ones) with long hairs; calyx limb ca. 1.5-2.5 mm broad, white, 5-lobed, the lobes at most 0.5-1 mm long, rather broadly rounded-triangular, commonly obtuse, rarely acutish, the reddish nerves terminating well below the base of lobes; petals bluish violet or whitish violet. F. July-August.

Wet solonchaks and saline meadows, shores of brackish lakes, and seacoasts. — European part: Bes. (S.); Bl., Crim., L. Don, L. V.; Caucasus: Cisc., Dag. W. Transc. (N.); W. Siberia; U. Tob., Irt.; Soviet Central Asia: Ar.-Casp., Balkh. (N.). **Gen. distr.:** Centr. Eur. (S.), Bal.-As. Min. (W.). Described from the northern part of the Caspian area. Type probably in Berlin (in Willdenow's herbarium).

- 451 **Note.** Very variable, particularly as regards the relative number of sterile branches in inflorescence. An extreme form, with a small number of sterile branches, was distinguished by Boissier (1848) as *β. patens* — from W. Altai (Liktevs), and later by Lipskii (1899) as *β. kimmerica* — from Anapa. Kuznetsov (l.c.) points out the similarity of these varieties. While agreeing with Kuznetsov, we may add that more or less similar forms apparently occur throughout the distribution area of *L. caspium* side by side with the typical form which, according to Willdenow and Boissier, would seem to be the one with more numerous sterile branches.

21. *L. coralloides* (Tausch) Lincz. comb. n. — *L. decipiens* Ktze. Rev. gen. II (1891) 395. — *Statice coralloides* Tausch in Sylloge Ratisb. II (1828) 255. — *S. decipiens* Ldb. Fl. alt. I (1829) 433 et Fl. Ross. III, 457, p.p. excl. hab. cauc.; Boiss. in DC. Prodr. XII, 661; Kuzn. in Mat. Fl. Kavk. IV, 1, 220; Kryl. Fl. Alt. 1075; Fedch. O. and B. Perech. rast. Turk. V, 183. — *S. aphylla* Poir. Encycl. meth. VII (1806) 408, non Forsk. 1775; Kryl. Fl. Zap. Sib. IX, 2158. — Ic.: Ldb. Ic. Fl. Ross. III, tab. 252. — Exs.: Kar. et Kir. Pl. Songor. No. 413 (sub. *S. decipiens*).

Perennial, 20-50 cm tall, densely hairy throughout (especially in upper part), the hairs short and stiff, mostly tufted and finely tubercled, often arranged in rather regular crossbands; taproot fairly stout; caudex strongly to subspherically thickened, short, woody, many-headed; leaves all radical, few and dying off completely before flowering, glaucous-green, obovate to oblong-spatulate, (0.5) 1-2 (3.5) cm long and (0.3) 0.5-1 (2) cm broad, round-tipped and apiculately longish-acuminate, gradually tapering at base into a short and broad petiole; scapes up to 20-30, erect or slightly ascending, tightly clothed at base in numerous large brown scales, terete, compoundly paniced nearly from base, in lower 2/3 or one half usually with very numerous compoundly and almost dichotomously divided sterile branches; spikes small, fairly dense, clustered on short terminal scape branches, forming a rather dense corymbose-paniculate inflorescence;

spicules ca. 3-3.5 mm long, 1- or 2-flowered; outer bract ca. 1 mm long, broadly ovate to suborbicular, obtuse or scarcely pointed, scarious except the very base and narrow midrib, glabrous or sparsely puberulous; first inner bract about twice as long, strongly concave and partly enclosing the
452 flowers, obtuse to subtruncate, very broadly scarious-margined, pubescent or glabrous; other inner bracts (one per flower; the first displaced and inserted just behind the outer bract, biparted at summit) much smaller, scarious, glabrous or slightly pubescent; calyx ca. 2.5-3.5 mm long, obconical or very slightly funnelform, the tube ca. 2 mm long and 1mm in diameter, rather densely covered with long hairs in lower part or throughout on the nerves and between them; calyx limb ca. 1-1.5 mm broad, white, 5-lobed, the lobes small (ca. 0.5 mm long), broadly rounded-triangular, obtusish, the reddish nerves terminating well below the base of lobes; petals bluish violet. Fl. July-August (Plate XXII, Figures 2, 2a).

Solonchaks and saline meadows. — W. Siberia: Irt., Alt. (SW); E. Siberia: Ang.-Say. (S.-Tuva Autonomous Region); Soviet Central Asia: Balkh. **Gen. distr.:** Dzu.-Kash. (N.), Mong. (W.). Described from "Siberia". Type in Prague (?).

Note. Ledebour's report of this species for S. Transcaucasia (Lenkoran area) has not so far been confirmed by new collections; it seems to be erroneous.

22. **L. macrorrhizon** (Ldb.) Ktze. Rev. gen. II (1891) 395; Stankov, Oprod. rast. Evrop. ch. SSSR, 739. — *Statice macrorrhiza* Ldb. Fl. alt. I (1829) 434 et Fl. Ross. III, 458; Boiss. in DC. Prodr. XII, 661; Korsh. in Mem. Acad. Sc. Petersb. VIII ser. VII, 1, 346 (Tentamen Fl. Ross. or. No. 1034); Fedch. O. and B. Perech. rast. Turk. V, 182. — Ic.: Ldb. Ic. Fl. Ross. III, tab. 259.

Perennial, 5-15 cm tall, rather densely hairy, the hairs short, stiff, solitary or rarely also tufted, more or less tubercled; taproot stout; caudex strongly to subspherically thickened, short, woody, many-headed or with numerous short branches; leaves all radical, fairly numerous but dying off completely before flowering, glaucous-green, linear to narrowly oblanceolate, 0.5-1 cm long and ca. 1 mm broad; scapes up to 30-50, erect or slightly ascending, tightly clothed at base in numerous commonly small and whitish scales, terete, compoundly panicled nearly from base; sterile branches borne nearly all the way up, rather numerous, compoundly and almost dichotomously branched; spikes small, fairly dense, clustered on short terminal scape branches, forming a dense distinctly corymbose inflorescence; spicules small, ca. 4-6 mm long, 1- or 2-flowered; outer bract ca. 1-2 mm long, broadly ovate to suborbicular, acutish or obtusish,
453 rather broadly scarious-margined, glabrous or pubescent; first inner bract 2-3 times as large, strongly concave and enclosing the flowers, obtuse to subtruncated, very broadly scarious-margined, pubescent or glabrous; other inner bracts (one per flower; the first displaced and inserted just behind the outer bract) much smaller, scarious; calyx ca. 4-5 mm long, rather broadly funnelform, the tube ca. 2.5-3 mm long and 1 mm in diameter, rather densely covered with long hairs all the way up or nearly so on the nerves and between them; calyx limb ca. 2 mm broad, white, 5-lobed, the lobes short, broadly triangular, acutish or obtusish, the bare or pubescent nerves terminating well below the base of lobes; petals bluish violet. Fl. July-August.

Stony slopes, saline chalk and clay outcrops in low mountains, on solonchaks (?).— W. Siberia: U. Tob. (SW), Irt. (S.); E. Siberia: Ang.-Say. (S.); the only location in the Minusinsk area: "on solonetz soils around Lake Kizyl-Kul", Martyanov, 15 July 1899, No. 951; Soviet Central Asia: Balkh. (N.) Endemic. Described from the NE part of the Lake Balkhash area (Chingiz Range area). Type in Leningrad.

23. *L. myrianthum* (Schrenk) Ktze. Rev. gen. II (1891) 395.— *Statice myriantha* Schrenk in Fisch. et Mey. Enum. pl. nov. Schrenk lect. I (1841, Julio) 14; Boiss. in DC. Prodr. XII, 660; Ldb. Fl. Ross. III, 462; Fedch. O. and B. Perech. rast. Turk. V, 132; Kryl. Fl. Zap. Sib. IX, 2156.— *S. latissima* Kar. et Kir. in Bull. Soc. Nat. Mosc. XIV, 4 (1841, Septembri) 729 (Enum. pl. alt. No. 724).— Exs.: Kar. et Kir., Pl. Songor. No. 974.

Perennial, 40-80 (100) cm tall, glabrous throughout except calyx, or rarely the scapes covered in lower part with short sometimes tufted hairs; taproot fairly stout; caudex often strongly thickened, short, woody, many-headed or with numerous short branches; leaves all radical (or rarely 2-8 also at the lower scape nodes and then resembling the radical leaves but smaller), few, glaucous-green or glaucous, broadly spatulate to broadly obovate, (5) 10-15 (25) cm long and (2) 5-8 (15) cm broad, mostly more or less slopingly rounded to subtruncate or slopingly emarginate, commonly very gradually tapering at base into, and about as long as or markedly exceeding, the broad and flat petiole; scapes 5-10, erect, terete, mostly smooth or rarely minutely verrucose; sterile branches mostly numerous, long, and more or less straight; spikes fairly long, loose, mostly many-spiculed, borne at the ends of scape branches, forming a spreading loosely 454 paniculate inflorescence; spicules ca. 3.5-4 mm long, 1- or 2 (3)-flowered (the outer flower usually borne on a pedicel 0.5-1 mm long); outer bract ca. 1-1.5 mm long, broadly ovate to suborbicular, obtusish or very short-acuminate, scarious except the base and the narrow midrib, glabrous; first inner bract similar but about twice as long, strongly concave and enclosing the flowers, very broadly scarious-margined, glabrous; other inner bracts (one per flower) much shorter, scarious; calyx ca. 3 mm long, narrowly funnelform or subconical, the tube ca. 1.5 mm long, irregularly and rather densely covered with long hairs nearly all the way up or merely in lower part (sometimes only on two nerves) or glabrous; calyx limb ca. 1.5 mm broad, white, 5-lobed, the lobes fairly large (nearly up to 1 mm long), rounded-triangular, obtusish or acutish, the bare reddish nerves terminating well below the base of lobes; petals bluish violet. Fl. June-August; fr. July-August.

Saline soils, commonly in river valleys and lake depressions on the more elevated terraces, and in *Lastagrostis splendens* stands. — Soviet Central Asia: Ar.-Casp. (SE part), Balkh., Dzu.-Tarb., Syr D., (N. part), T.Sh. (Kegen R. valley, Issyk-Kul' depression, Naryn and Talass river valleys). **Gen. distr.:** Dzu.-Kash. (N. part). Described from the eastern part of the Balkhash area (area around Lakes Balkhash and Ala-Kul'). Type in Leningrad.

Note. Of apparently fairly common occurrence in saline valleys in the Chu-Ili Mountains and adjacent parts of the Ili and Chu river valleys is a characteristic form with short hairs on the lower part of scapes and from 2 to 8 fairly large leaves at the lower scape nodes. This form is recorded

(in herb.) by Z. V. Kubanskaya as *Statice Popovii* Z. Kub. (*Limonium Popovii* Z. Kub.) and it is possible that (following clarification of details of distribution and ecology, and the relationship to the typical form) it may have to be separated as a distinct minor species.

24. *L. ferganense* Ik.-Gal. in Tr. Bot. inst. AN SSSR, ser. I, 2 (1936) 262.—*L. Komarovii* Ik.-Gal. l.c. 263, in observ.—*Statice ferganensis* Ik.-Gal. l.c. 262, pro syn.—*S. gracilis* O. et B. Fedtch. Perech. rast. Turk. V (1913) 183, non Fisch. ex Boiss.—Ic.: Ik.-Gal. l.c. Fig. 3.

Perennial, 40-75 cm tall; taproot fairly stout; caudex strongly thickened, many-headed, densely clothed in remnants of leaf petioles; leaves all radical, fairly numerous, glaucescent-green, obovate to spatulate, (2) 5-15 cm long and 1-3.5 cm broad, more or less round at apex or obtuse to scarcely emarginate, gradually tapering at base into and usually much shorter than the petiole, the latter rather narrow but strongly dilated at base; scapes 5-10, all more or less terete, glabrous, smooth, rather strongly flexuous, from rather low down compoundly panicked, with numerous branches; sterile branches absent; spikes 1.5-4 cm long, loose or fairly loose, with joints up to 5 mm long, 5-15-spiculed, more or less recurved, borne at the ends of scape branches and forming a loose panicate inflorescence; spicules 1- or 2 (4)-flowered, the outer flower on a pedicel up to 1.5 mm long; outer bract ca. 1.5-2 mm long, broadly ovate to suborbicular, obtusish or very short-pointed, rather broadly scarious-margined, glabrous; first inner bract similar but 2-2 1/2 times as long, strongly concave and enclosing the flowers, broadly scarious-margined, scarious, the midrib not usually reaching the summit; calyx 5-6.5 mm long, broadly funnelform, the tube ca. 3-4 mm long, irregularly and fairly densely hairy, the hairs sometimes confined to one side, rather long, minutely glandular; calyx limb ca. 2 mm broad, white, 5-lobed, the lobes fairly large, triangular-ovate, obtusish or acutish, the bare purple nerves terminating well below the margin; petals bluish violet. Fl. June-July; fr. July-August.

Mountain slopes.—Soviet Central Asia: Pam.-Al. (Shakhimardan area, Fan R. basin—tributary of the Zeravshan), T.Sh. (Maili-Sai area northeast of Namagan). Endemic. Described from the Maili-Sai and Namagan areas. Type in Leningrad.

Note. The author refrains for the time being from provisionally acknowledging *L. Komarovii* Ik.-Gal., a species reported by N. P. Ikonnikov-Galitskii from the Zeravshan River basin. As far as may be judged from the limited material, it represents merely a minor form that does not differ in essential characters from *L. ferganense* Ik.-Gal.

25. *L. otolepis* (Schrenk) Ktze. Rev. gen. II (1891) 396.—*Statice otolepis* Schrenk in Bull. Acad. Petersb. I (1843) 362 et in Ann. sc. nat. 2 ser. XX (1843) 64; Boiss. in DC. Prodr. XII, 662 et Fl. or. IV, 866; Ldb. Fl. Ross. III, 467; Fedch. O. and B. Perech. rast. Turk. V, 183; Kryl. Fl. Zap. Sib. IX, 2159; Androsov in Tr. Turkmenskogo Bot. sada, I, 51.

Perennial, (20) 40-80 (120) cm tall, glabrous throughout except calyx; taproot (or rootstock) fairly stout; caudex simple or more or less many-headed, commonly not strongly thickened; radical leaves few and almost

456 completely dying off at about flowering time, obovate-spatulate, 3-8 cm long and 1.5-3 cm broad, obtuse, round-tipped to slightly emarginate, very gradually tapering into a short flat petiole; leaves on scapes mostly borne at the lower scape nodes and the lower part of branches, sessile and clasping to subperfoliate, rounded-reniform to suborbicular, 0.5-3 cm in diameter, gradually dying off and falling after flowering; scapes numerous, occasionally solitary, erect, terete, glabrous and smooth, in upper two-thirds compoundly paniced with rather short branches; sterile branches very numerous with numerous slender secondary branches; spikes short, rather densely clustered at the ends of terminal scape branches, forming a dense paniculate inflorescence; spicules ca. 2.5-3 mm long, 1 (2)-flowered; outer bract ca. 1 mm long, broadly ovate, to suborbicular, short-pointed or obtusish, scarious except the very base and sometimes the narrow midrib; first inner bract similar but about twice as long, strongly concave and enclosing the flower, very broadly scarious-margined, subtruncate; innermost bract much smaller, scarious; calyx ca. 2-2.5 mm long, obconical, the tube ca. 1 mm long, irregularly and rather sparsely hairy in lower part or all the way up, the hairs often confined to one side, fairly long; calyx limb ca. 1 mm broad, white, 5-lobed, the lobes ca. 0.5 mm long, rounded-triangular, obtuse, the reddish nerves terminating well below the base of lobes. Fl. May-August; fr. June-August.

Solonchaks and saline soils, commonly in river valleys, sometimes a weed of cultivated fields and irrigation ditches.—Soviet Central Asia: Ar.-Casp., Balkh., Kyz. K., Kara K., Amu D., Syr D., Pam.-Al. (W. part, plains). **Gen. distr.:** Iran. (N. Afghanistan). Dzu.-Kash. Described from the lower reaches of the Chu and Sarysu rivers. Type in Leningrad.

26. **L. reniforme** (Girard) Lincz. comb. n.—*L. perfoliatum* Ktze. Rev. gen. II (1891) 396.—*Statice reniformis* Girard in Ann. sc. nat. 3 ser. bot. II (1844) 325.—*S. perfoliata* Kar. in Bull. Soc. Nat. Mosc. XII (1839) 167, nomen et ex Ldb. Fl. Ross. III (1847-1849) 468; Fedch. O. and B. Perech. rast. Turk. V, 183; Androsov in Tr. Turkmenskogo Bot. sada, I, 52.—*S. perfoliata* C.A.M. ex Boiss. in DC. Prodr. XII (1848) 663 (incl. *β. reniformis* Boiss.) et Fl. or. IV, 866.—Ic.: Larin, Korm. rast. estestv. senokosov i pastb. SSSR, Fig. 653 (as *Statice otolepis* Schrenk).—Exs.: Aucher, Herb. or. No. 5246 (typus!); Kotschy, Pl. Pers. austr. No. 464; Sintenis, It. transcasp.-pers. 1900-1901, No. 508.

457 Perennial, 60-80 (120) cm tall, glabrous throughout except calyx; taproot fairly stout; caudex more or less many-headed, mostly little thickened; radical leaves numerous and almost completely dying off about flowering time, glaucescent-green, obovate-spatulate, 3-8 cm long and 1-2 (3) cm broad, round-tipped or slightly pointed, very gradually tapering at base into a short flat petiole; leaves on scapes usually very numerous, borne at nearly all the scape nodes and on the branches, sessile, clasping, often perfoliate, on the lower and middle parts of the scape commonly ovate or oblong-elliptic and large, up to 4-6 cm long and 2.5-3 cm broad, higher up the scape and on the branches more rounded to reniform or biparted, gradually diminishing in size, not dying off at flowering; scapes few, sometimes solitary, erect, terete, glabrous and more or less smooth, commonly in upper three-quarters or two thirds compoundly paniced, often with long branches; sterile branches none or very few; spikes rather long,

clustered on several terminal scape branches, forming a very loose spreading paniculate inflorescence, with distant branches; spicules ca. 3.5-4 mm long, 2- or 3-flowered; outer bract ca. 1-1.5 mm long, rather broadly ovate, short-acuminate or obtusish, scarious except the base and the rather narrow midrib; first inner bract similar but about twice as long, strongly concave and partly enclosing the flowers, rather broadly scarious-margined, obtuse; other inner bracts (one per flower) much smaller, scarious; calyx ca. 3-4 mm long, rather narrowly funnelform, the tube ca. 1.5-2 mm long, in lower part or nearly all the way up (mostly on one side only) rather densely covered with long hairs; calyx limb 1.5-2 mm broad, white, 5-lobed, the lobes up to 1.5 mm long, ovate, acutish, the reddish nerves nearly reaching the middle of lobes; petals bluish violet. Fl. May-October; fr. June-October.

Solonchaks and saline soils, commonly in river valleys, sometimes as weed in cultivated fields and along irrigation ditches. — Soviet Central Asia: Kara K. (S. part), Mtn. Turkm. (low mountains), Amu D., Syr D. (S. part), Pam.-Al. (W. part, plains and low mountains). **Gen. distr.:** Iran. Described from S. Iran. Type in Paris.

Section 4. **SARCOPHYLLUM** (Boiss.) Lincz. comb. n. — Subsect. *Sarcophyllae* sect. *Limonium* Boiss. in DC. Prodr. XII (1848) 663. — Calyx obconical or narrowly funnelform, with a rather narrow limb, nearly straight at base. Subshrubs with rather long, leafy, ligneous branches.

- 458 27. **L. suffruticosum** (L.) Ktze. Rev. gen. II (1891) 396; Grossg. Oprod. rast. Kavk. 593. — *Statice suffruticosa* L. Sp. pl. (1753) 276; M. B. Fl. taur.-cauc. I, 253; Boiss. in DC. Prodr. XII, 663; Ldb. Fl. Ross. III, 468; Boiss. Fl. or. IV, 867; Shmal'g. Fl. II, 192; Chernova in Tr. prikl. bot., gen. isel., ser. X, 1, 150; Leisle in Fl. Yugo-Vost. VI, 39; Kryl. Fl. Zap. Sib. IX, 2160; Klok. in Vizn. rosl. URSR, 707. — *S. suffruticosa* var. *typica* Trautv. in Bull. Soc. Nat. Mosc. XL., 3 (1867) 95; Kuzn. in Mat. Fl. Kavk. IV, 1, 221; Fedch. O. and B. Perech. rast. Turk. V, 183; Grossg. Fl. Kavk. ed. 1, III, 219. — *S. glauca* Less. in Linnaea, IX (1835) 196, non Willd. — Ic.: Gmel. Fl. Sib. II, tab. 88, f. 2, 3; Hill. Veg. syst. V, tab. 14; Chernova, l. c., Figs. 5, 6; Korov. Rast. Sr. Az., Fig. 135; Larin, Korm. rast. estestv. senokosov i pastb. SSSR, Fig. 654. — Exs.: GRF, No. 1085; Herb. Fl. Cauc. No. 443; Sintenis, It. transcasp.-pers. 1900-1901, No. 1253.

Perennial, 10-30 (60) cm tall; taproot fairly stout, caudex strongly branched, woody, with rather long ascending or nearly upright branches; leaves borne on annual (later partly lignified) shoots as rather dense fascicular rosettes at the base of scapes, fairly numerous, thickish, fleshy, glaucous-green, oblong-spatulate, (0.5) 1-3 (7) cm long and 0.2-0.5 (1) cm broad, obtuse, round-tipped, gradually tapering into a fairly broad flat petiole, this passing into a broad partly clasping broadly scarious-margined sheath with two auriculiform obtusish membranous appendages at the petiole base; scapes 10-25 (50), erect or slightly ascending, terete, glabrous, smooth or rather densely and minutely verrucose, more or less flexuous, simple or (mostly once) branched; spikes 0.5-1 cm long, 5-10-spiculed, compact, sessile, solitary or gathered in capitate clusters of several, forming an interruptedly (or at the top approximately) spiciform

inflorescence on the upper part of the scape and its branches; spicules (2) 3-5-flowered; outer bract ca. 1.5-3 mm long, broadly ovate, obtuse or slightly pointed, rather narrowly scarious-margined, glabrous, rarely pubescent; first inner bract similar but 2-2 1/2 times as long, strongly concave and partly enclosing the flowers, broadly scarious-margined, glabrous or rarely rather densely pubescent; other inner bracts (one per flower) much smaller, scarious, with narrow nerves; calyx about 3.0-4.5 mm long, obconical; the tube ca. 2-2.5 mm long and 0.5 mm in diameter, glabrous or rarely pubescent (sometimes on the inside); calyx limb ca. 1.5-2 mm broad, white, rather distinctly 10-lobed, the primary lobes ca. 0.5-1 mm long, rounded
459 triangular to subovate, obtusish or acutish, the bare or rarely pubescent nerves not reaching above the base of lobes, the intermediate lobes much smaller; petals white (?), pale violet or bluish violet. Fl. July-October; fr. August-October (Plate XXII, Figures 3, 3a).

Solonchaks and saline soils, shores of brackish lakes, and seacoasts. — European part: Transv. (S. part), Bl. (S., maritime part), Crim. (plains), L. Don (E. part), L.V.; Caucasus: ? Dag. (Caspian seaboard), E. Transc. (E. part); W. Siberia: U. Tob. (S. part), Irt. (S. half); Soviet Central Asia: Ar.-Casp., Balkh., Kyz.K., Kara K., Amu D., Syr D., Pam.-Al. (S. Tadzhikistan, Lower Zeravshan). **Gen. distr.:** Iran. (Iran and Afghanistan), Dzu.-Kash. (N., Dzungarian part), Mong. (SW — Dzungarian Gobi). Described from "Siberia". Type in London.

Note. The earlier claims of most authors that *L. suffruticosum* is completely glabrous (with glabrous calyx) must be rejected, since specimens with hairy calyx (sometimes fairly densely so) are known from all parts of the distribution area of this species. Such specimens, however, occur clearly together with specimens with bare calyx. The occurrence of vestiture on bracts is also fairly frequent and it is, on the average, more pronounced in specimens from southern Turkmenia, the eastern coast of the Caspian Sea, and eastern Transcaucasia.

2) B.A. Fedchenko and N. F. Goncharov described from the Ural River basin what they consider to be a hybrid between *L. suffruticosum* (L.) Ktze. and *L. Gmelinii* (Willd.) Ktze., under the name *Statice erectiflora* B. Fedtsch. et Gontsch. (in Tr. Bot. Sada, XLI (1929) 98, Plate I). To judge from the description and illustration, the plant closely resembles *L. suffruticosum*, from which it differs chiefly in the loose inflorescence, like that of *L. Gmelinii*, but with nearly straight and upright branches. Further study of this form is needed.

28. *L. leptophyllum* (Schrenk) Ktze. Rev. gen. II (1891) 395. — *Statice leptophylla* Schrenk in Bull. Acad. Sc. Petersb. III (1845) 211; Ldb. Fl. Ross. III, 469; Trautv. in Bull. Soc. Nat. Mosc. XXXIX, 4 (1866) 459 (Enum. pl. song. Schrenk. No. 925); Boiss. Fl. or. IV, 867. — *S. suffruticosa* var. *leptophylla* Trautv. in Bull. Soc. Nat. Mosc. XL, 3 (1867) 96 (Enum. pl. song. Schrenk. Addenda); Kuzn. in Mat. Fl. Kavk. IV, 1, 222; Fedch. O. and B. Perech. rast. Turk. V, 184. — Ic.: Korov. and Mironov in Tr. SAGU, Ser. VIII b, 21, Fig. 15.

Perennial, 20-40 cm tall; taproot fairly stout; caudex strongly branched, woody, the branches rather long ascending to suberect; leaves borne on annual shoots (these becoming partially lignified), commonly in dense
460 rosettelike tufts at the base of scapes, fairly numerous, thickish, fleshy, glaucous-green, subcylindrical, slightly flattened, at the top more or less

distinctly triquetrous and not enlarged or almost imperceptibly enlarged, obtusish or acutish, (0.5) 2-5 cm long and ca. 1 mm in diameter, passing at base into a sheath, this broad, partly clasping, broadly scarious-margined, in upper part asymmetrically shouldered but not auriculate or very slightly auriculate; scapes 10-25, erect or slightly ascending, terete, glabrous, more or less smooth, mostly rather strongly flexuous, in upper half to two thirds compoundly panicled; spikes 0.5-1 cm long, rather narrow, 5-10-spiculed, fairly loose, borne on slender terminal scape branches, forming a broad loosely paniculate inflorescence; spicules 2- or 3-flowered; outer bract ca. 1.5-2 mm long, broadly ovate, obtuse or slightly pointed, rather narrowly scarious-margined, glabrous; first inner bract similar but about twice as long, strongly concave and partly enclosing the flowers, broadly scarious-margined, glabrous; other inner bracts (one per flower) much smaller, scarious, with a narrow midrib; calyx ca. 2.5-3 mm long, obconical, the tube ca. 1.5-2 mm long and 0.5 mm in diameter, glabrous or rarely the nerves (sometimes merely at base) sparsely covered with short hairs; calyx limb ca. 1-1.5 mm broad, white, rather distinctly 10-lobed, the primary lobes ca. 0.5 mm long, subovate, round-tipped or slightly pointed, the bare or sparsely hairy nerves mostly not reaching beyond the base of lobes, the intermediate lobes somewhat smaller; petals pale violet or violet. Fl. August-October; fr. August-October.

Solonchaks, saline sands, and stony slopes in low desert mountains. — Soviet Central Asia: Ar.-Casp. (S. — Kzyl-Ordy area), Balkh. (Ili and Chu river valleys, Chu-Ili Mountains, E. Bet-Pak-Dala, Muyun-Kum (sandy desert)), Syr D. (N. part, adjoining the Karatau), T. Sh. (low mountains of the Karatau Range). Endemic. Described from the Chu-Ili Mountains (Khantau) and from the Chu River. Type in Leningrad.

Note. Forms are known that are intermediate (hybrid?) between *L. leptophyllum* and *L. suffruticosum*, with broader and apically distinctly enlarged leaves with rather pronounced auricular appendages at base.

29. ***L. carnosum*** (Boiss.) Ktze. Rev. gen. II (1891) 395; Grossg. Oprod. rast. Kavk. 594. — *Statice carnosa* Boiss. in DC. Prodr. XII (1848) 663 et Fl. or. IV, 867. — *S. suffruticosa* var. *typica* Trautv. in Tr. Bot. Sada, VII, 2 (1881) 504, non Trautv. 1867. — *S. suffruticosa* var. *carnosa* Kusn. in Mat. Fl. Kavk. IV, 1 (1903) 222.

461 Perennial, (10) 20-40 cm tall; taproot fairly stout; caudex strongly branched, woody, the rather long branches ascending to suberect; leaves borne on annual shoots (these becoming partially lignified), commonly in dense rosettelike tufts at the base of scapes, fairly numerous, thickish, fleshy glaucous-green, linear-spatulate, rather obtusely cuneate at base, (0.5) 1-3 (4) cm long and ca. 0.2-0.6 cm broad, obtuse, round-tipped or acutish, gradually tapering at base into a flattish petiole; sheath broad, partly clasping, broadly scarious-margined, in upper part asymmetrically shouldered and exauriculate; scapes 10-15, erect, terete, glabrous, rather smooth, gently flexuous to nearly straight, in upper half to two thirds panicled; spikes 0.5-1 cm long, fairly narrow, 5-10-spiculed, rather loose, often borne approximately on slender terminal scape branches, forming a rather broad loosely paniculate inflorescence; spicules 2- or 3-flowered; outer bract ca. 1.5-2.5 mm long, broadly ovate, obtuse to subacute, rather broadly scarious-margined, glabrous; first inner bract similar but about

twice as long, strongly concave and partly enclosing the flowers, broadly scarious-margined, glabrous; other inner bracts (one per flower) much smaller, scarious, with a narrow midrib; calyx 4-5 mm long, narrowly funnelform, the tube ca. 2-3 mm long and 0.5 mm in diameter, glabrous or at the very base very slightly pubescent; calyx limb ca. 2 mm broad, white, rather distinctly 10-lobed, the primary lobes up to 1-1.5 mm long, broadly ovate, round-tipped or acutish, the bare nerves not reaching beyond the base of lobes, the intermediate lobes much smaller; petals pale violet. Fl. July-October; fr. August-October.

Solonchaks and gypseous slopes in low mountains. Caucasus: S. Transc. (Nakhichevan ASSR). **Gen. distr.:** Arm.-Kurd. Described from NW Iran (in the vicinity of the town of Khoi, near Tebriz). Type in Geneva.

Note. In central and southern Iran, this species is replaced by *L. iranicum* (Bornm.) Lincz. comb. n. [*Statice leptophylla* var. β . *iranica* Bornm. in Beih. z. Bot. Centralblatt, XXII (1907) 140. — *S. carnosa* Bornm. in sched. ad exs. It. pers.-turc. 1892-1893, No. 4578, non Boiss.], which is distinguishable by the smaller obconical (not narrowly funnelform) calyx ca. 2.5-3 mm long, the calyx tube glabrous or its nerves hairy to a varying extent, the calyx limb ca. 1 mm broad, the lobes not exceeding 0.5 mm in length, obtuse to subtruncate.

462 Section 5. **SIPHONOCALYX** Lincz. sect. n. in Addenda XVII, 749. — Calyx tubular, the limb straight or very slightly reflexed, straight or nearly straight at base. Perennial plants.

Series 1. **Sogdiana** Lincz. — Spikes long-jointed, borne on terminal scape branches. Series type: *L. sogdianum* (M. Pop.) Ik.-Gal.

30. *L. sogdianum* (M. Pop.) Ik.-Gal. in Tr. Bot. inst. AN SSSR, Ser. I, 2 (1936) 268. — *L. piptopodum* Nevski in Tr. Bot. inst. AN SSSR, Ser. I, 4 (1937) 313. — *Statice sogdiana* M. Pop. in Sprygin and Popov, Bot.-geogr. issled. v Turkest. (1915) 51, nomen; Fedch. O and B. Perech. rast. Turk. VI, 355; Ik.-Gal., l. c., 268, pro syn. — *S. Spiridonowi* B. Fedtsch. in Tr. Glavn. Bot. Sada, XXXV (1921) 210, nomen. — Ic.: Ik.-Gal., l. c., Fig. 5; Nevskii, l. c., Fig. 12.

Perennial, 25-80 cm tall; taproot fairly stout; caudex rather strongly thickened, woody, commonly many-headed, rather densely clothed in remnants of leaf petioles; leaves all radical (or very rarely, much smaller, also at the lower scape nodes), fairly numerous, glaucous-green, broadly obovate to spatulate, 3-10 cm long and 1-4.5 cm broad, nearly always obtuse, round-tipped or rarely slightly emarginate, often spiculate-mucronulate, rather gradually tapering at base into and about as long as the flat petiole; scapes 2-5 (10), erect, all terete, glabrous, densely and minutely calcareo-punctulate, rather strongly flexuous, compoundly paniced nearly from base with long branches; sterile branches very few or none; spicules 6-9 mm long, solitary, (0.5) 1-2 cm apart, on the terminal scape branches, 2-4-flowered, the flowers borne on pedicels up to 2 mm long; outer bract 2-4 mm long, ovate to broadly ovate, obtusish or slightly pointed, broadly scarious-margined, glabrous or rarely scarcely pubescent; first inner bract similar but 2-3 times as long, strongly concave and partly enclosing the flowers, rather broadly scarious-margined,

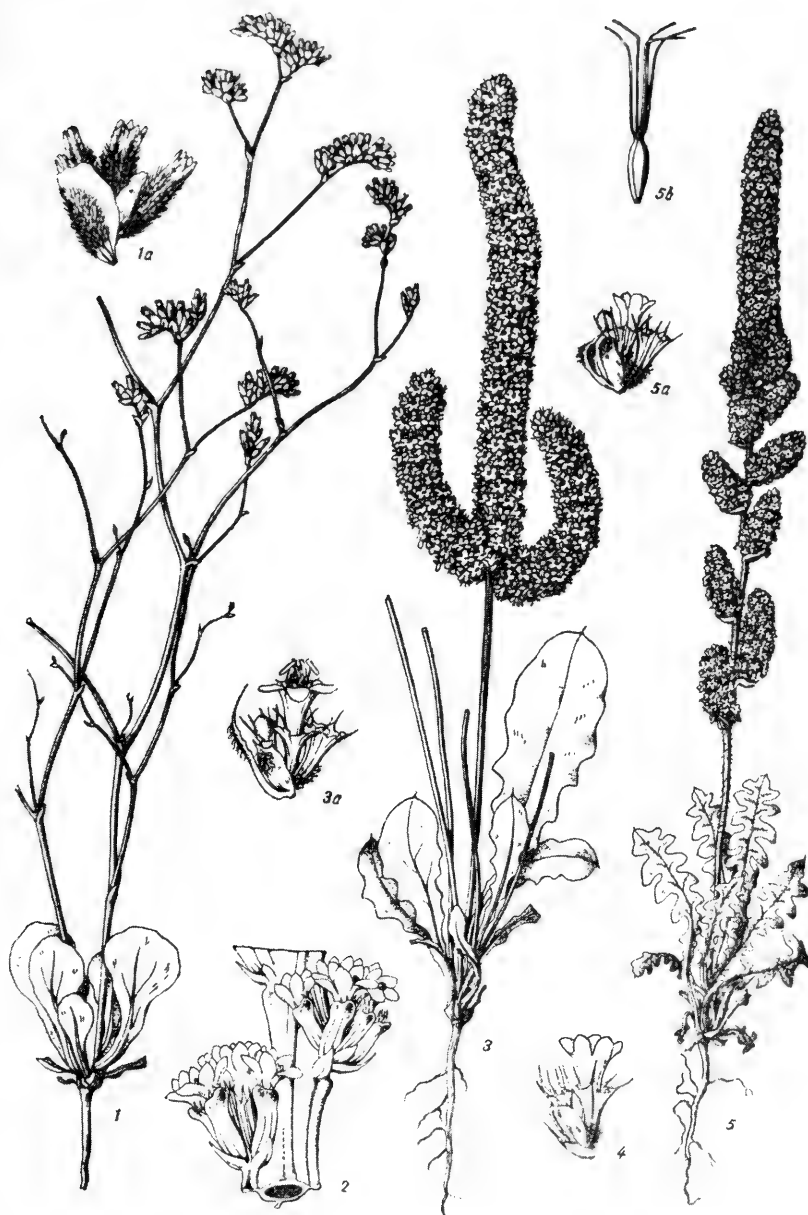


Plate XXIII

1. *Limonium drepanostachyum* Ik.-Gal., 1a) spicule.—2. *Psylliostachys leptostachya* (Boiss.) Roshk., portion of spike.—3. *P. Suworovii* (Rgl.) Roshk., 3a) spicule.—4. *P. anceps* (Rgl.) Roshk., spicule.—5. *P. spicata* (Willd.) Nevski, 5a) spicule, 5b) ovary.

465 glabrous to densely pubescent with rather long and minutely glandular hairs; other inner bracts (one per flower) much smaller (at most reaching the middle of the calyx), scarious, the narrow midrib not reaching the summit; calyx 4-7 mm long, tubular, the limb straight or scarcely reflexed; calyx tube ca. 3-5 mm long and 1 mm in diameter, densely covered throughout with long minutely glandular hairs on and between the nerves; calyx limb ca. 1.5-2 mm broad, whitish, 5-lobed, the lobes 0.5-1 mm long, triangular-ovate, round-tipped, the nerves hairy in lower part or nearly all the way up, reaching or not reaching the margin; petals glaucescent-violet. Fl. May-July; fr. June-August.

On outcrops of mottled gypsiferous strata and in saline soils, in low mountains and in foothills. — Soviet Central Asia: Amu D. (Charshanga-Kutigang), Syr D. (Alymtau), Pam.-Al. (Baisun, hammada on the left bank of the Zeravshan in the Kizyl-Tepe area, Golodnaya Steppe). Endemic. Described from the vicinity of Kizyl-Tepe. Type in Leningrad.

Note. The material now available is insufficient for differentiation of minor forms of this species, one of which has already been recorded as *L. piptopodum* Nevski.

Series 2. **Drepanostachya** Lincz. — Spicules gathered in compact spikes borne 1-3 at the ends of scape branches. Series type: *L. drepanostachyum* Ik.-Gal.

31. *L. drepanostachyum* Ik.-Gal. in Tr. Bot. inst. AN SSSR, Ser. I, 2 (1936) 267. — *Statice flexuosa* O. et B. Fedtsch., Perech. rast. Turk. V (1913) 184 et auct. fl. Turk. non L. — Ik.-Gal., l.c., Fig. 4.

Perennial, 25-70 cm tall; taproot fairly stout; caudex very slightly branched, rather densely clothed in remnants of leaf petioles; leaves all radical, fairly numerous, glaucous-green, broadly obovate to spatulate, 2-6 cm long and 1-3 cm broad, obtuse, round-tipped, commonly minutely attenuate-mucronulate, gradually tapering at base into and markedly longer than the very broad flat petiole; scapes 1-3 (10), erect, subterete, glabrous, rather strongly flexuous, compoundly paniced nearly from base with long branches; sterile branches few in lower part or absent; spikes 1-2 cm long, compact, mostly subfalcately recurved, 5-15-spiculed, aggregated in twos or threes or solitary at the ends of scape branches; spicules 3-7-flowered, the flowers on pedicels up to 1.5 mm long; outer bract 2.5-3.5 mm long, 466 broadly ovate to suborbicular, obtuse, round-tipped, broadly scarious-margined, rather densely pubescent or glabrous; first inner bract similar but 2-2 1/2 times as long, strongly concave and partly enclosing the flowers, very broadly scarious-margined, densely covered with rather long hairs; other inner bracts (one per flower) much smaller, 1/2-3/4 the length of calyx tube, scarious, irregularly truncate, the narrow midrib not reaching the summit; calyx 5-6 mm long, tubular, the limb straight or scarcely reflexed; calyx tube ca. 3.5-4.5 mm long and 1 mm in diameter, densely covered throughout with long hairs on and between the nerves; calyx limb ca. 1.5-2.5 mm broad, whitish, 5-lobed, the lobes ca. 0.5 mm long, broadly rounded-triangular, obtuse or acutish, the nerves hairy in lower part, reaching or not reaching the margin or excurrent; petals bluish-violet. Fl. May-July; fr. June-July (Plate XXIII, Figures 1, 1a).

Solonchaks and sands in foothill plains, gravelly slopes in low mountains (up to 900-1000 m above sea level), commonly in wormwood and *Salsola*

associations. — Soviet Central Asia: Syr D. (Fergana Valley), Pam.-Al. (foothills of the Alai Range south of Kokand), T. Sh. (low mountains north of Namangan). Endemic. Described from the foothills of the Alai Range between the villages of Rishtan and Chongor. Type in Leningrad.

32. **L. Fajzievii** Zakirov sp. n. in Addenda XVII, 748.

Perennial, 40-60 cm tall; taproot fairly stout; caudex (in grown specimens) thickened, woody, many-headed, rather densely clothed in remnants of leaf petioles; leaves all radical, fairly numerous, glaucous-green, oblong-obovate to spatulate, 2-4 cm long and 0.5-1 cm broad, more or less rounded at apex, attenuate-mucronulate, gradually tapering at base and about equaling to markedly longer than the broad flat petiole; scapes 1-5, erect, more or less terete, glabrous, rather strongly flexuous, compoundly long-branched nearly from base; sterile branches few on the lower half of scape or absent; spikes 1-3 cm long, compact, commonly more or less falcately curved, 5-15 (20)-spiculed, aggregated in twos or threes or solitary at the ends of scape branches; spicules 3-5-flowered, the flowers borne on pedicels ca. 1 mm long; outer bract 5-6 mm long, strongly concave and clasping the first inner bract, broadly ovate, more or less acuminate, glabrous or scarcely puberulous; first inner bract
467 similar but half as long again as the outer bract, obtuse, very broadly scarious-margined, strongly concave and partly enclosing the flowers, glabrous below, in upper part densely covered with long minutely glandular hairs; other inner bracts (one per flower) much shorter, about the length of the calyx tube, scarious, round-tipped or irregularly truncate, the narrow midrib not reaching the summit; calyx ca. 6 mm long, tubular, with straight or scarcely reflexed limb; calyx tube ca. 3 mm long and 1 mm in diameter, minutely glandular-puberulous throughout on and between the nerves; calyx limb ca. 3 mm broad, whitish or pinkish, 5-lobed, the lobes ca. 1 mm long, rather narrowly triangular, acute to obtusish, the bare nerves reaching or not reaching the margin; petals bluish-violet. Fl. July; fr. August.

On outcrops of mottled gypsiferous strata. — Soviet Central Asia: Pam.-Al. (Zeravshan R. basin). Endemic. Described from the vicinity of the village of Vishist. Type in Tashkent; isotype in Leningrad.

Note. Readily distinguishable from *L. drepanostachyum* Ik.-Gal. by the large (5-6 mm long) outer bracts, larger acute calyx lobes, and minutely glandular (not simple) hairs on bracts and calyx.

Genus 1142. **PSYLLIOSTACHYS** * (JAUB. ET SP.) NEVSKI**

Nevskii in Tr. Bot. inst. AN SSSR, Ser. I, 4 (1937) 314. — Statice subgen. *Psylliostachys* Jaub. et Sp. Illustr. pl. or. I (1842-1843) 158.

Calyx subtubular or funnelliform, scarious, 5-lobed, the lobes herbaceous, straight at base, the bare nerves not reaching the margin of lobes or excurrent in a fairly long aristate point, the tube rather densely glandular-pubescent in lower half; corolla gamopetalous, subinfundibular, with a long

* From *Psyllium*, the name of a subgenus of *Plantago* L. and *stachys*, spike, apparently on account of resemblance to the inflorescence of *Plantago psyllium* L.

** Prepared by O.I. Rozhkova.

tube and a small 5-lobed limb not incurved after anthesis; filaments of stamens nearly distinct, adnate to corolla tube merely to the height of ovary, bare; styles distinct from base, bare; stigmas cylindrically filiform; ovary oblong-obovoid to sublinear, distinctly ribbed, slightly narrowed at the top, the transition between ovary and style rather clear; fruit oblong-obovoid to sublinear, dehiscent with valves (without a lid). Annual plants; leaves
 468 simple or more often pinnatifid; scapes simple or simple paniced; flowers white or pink; spicules 2-4-flowered, aggregated in rather dense oblong broad or narrow spikes.

The genus contains 7 or 8 known species distributed throughout Soviet Central Asia, the Caucasus, Afghanistan, and Iran, and westward to Syria and Palestine.

1. Calyx lobes long-aristate; inflorescence usually a simple panicle; corolla rose 2.
- + Calyx lobes not long-aristate; inflorescence a slender simple spike; corolla white 1. *P. leptostachya* (Boiss.) Roshk.
2. Leaves glabrous, rarely the petiole and midrib villous; outer bract* linear-subulate or slightly enlarged at summit and point-tipped, half as long again to twice as long as the inner bract 2. *P. Suvorovii* (Rgl.) Roshk.
- + Leaves covered rather densely on the petiole and midrib and scatteredly on the laminae with long flat crisp hairs 3.
3. Scapes hairy throughout; outer bract equaling or slightly exceeding the inner bract, oblong-spatulate, ovately enlarged in upper part and cochlear on the inside 3. *P. spicata* (Willd.) Nevski
- + Scapes glabrous in upper part; outer bract half to two thirds as long as the inner bract, broadly rounded-triangular, terminating in a short or long point 4. *P. anceps* (Rgl.) Roshk.

1. *P. leptostachya* (Boiss.) Roshk. comb. n.—*Statice leptostachya* Boiss. Diagn. pl. or. ser. 1, VII (1846) 68; Boiss. in DC. Prodr. XII, 669 et Fl. or. IV, 872; O. and B. Fedtch. Perech. rast. Turk. V, 186.—? *S. turkestanica* Gandoger in Bull. Soc. Bot. France, LXVI (1919) 221.—*Limonium leptostachyum* Ktze. Rev. gen. II (1891) 395.—Exs.: Kotschy, Pl. Pers. austr. No. 367 (typus!); GRF, Nos. 2780a, 2780b; Ed. H. B. P. No. 21.

Annual, (5) 10-20 (50) cm tall; leaves all radical, glaucescent-green, oblanceolate in outline, (2.5) 4-10 (15) cm long and 0.5-2.5 cm broad, almost regularly and deeply (nearly to the midrib) pectinate-pinnatisect, the segments linear or irregularly linear to narrowly triangular, narrow, commonly recurved, entire, obtusish to subacute; scapes 1-10, rarely up to 40-60, greatly exceeding the leaves, straight or slightly flexuous,
 469 slender, simple or very rarely irregularly and slenderly branched, glabrous or scarcely pubescent, narrowly and angularly winged; inflorescence narrowly spiciform, ca. 0.4-0.7 cm in diameter, beginning nearly at the base of scape; spicules (1) 2- or 3 (4)-flowered, sessile, borne in threes or rarely in the middle part of inflorescence in fives or sixes and then imbricated-distichous, with 3 in outer rank and 2 or 3 in the inner; bracts 2 in each spicule, glabrous; outer bract 0.5-1.5 mm long, narrowly triangular, cuspidate, rigidly herbaceous, narrowly scarious-margined;

* Always examine the middle part of the spike.

inner bract much larger and nearly concealing the flowers, 2-2.5 mm long, linear-spatulate, conspicuously thickened at apex, round-tipped, commonly shallowly emarginate, green, rigidly herbaceous, concave and scarious-margined; calyx ca. 1.5-2 mm long, subtubular, with obsolescent limb; calyx tube ribbed, scarious, with narrow herbaceous nerves, in lower part rather densely covered with appressed glandular hairs; calyx limb deeply parted into acutely triangular scarious lobes, ca. 0.3-0.5 mm long, the nerves nearly reaching the summit; corolla white, ca. 3 mm long, funnelliform, exserted from the calyx tube, with 5 ovate or rounded-ovate obtuse lobes. Fl. April-May; fr. May (June?). (Plate XXIII, Figure 2).

Solonchaks and saline soils, on plains.—Soviet Central Asia: Balkh. (SW part), Kyz. K., Kara K. (S. part), Mtn. Turkm. (Badkhyz), Amu D., Syr D., Pam.-Al. (S. Tadzhikistan). **Gen. distr.:** Iran. (Iran and Afghanistan). Described from S. Iran (in the vicinity of Shiraz). Type in Geneva; isotype in Leningrad.

Note. Hybrids between *P. Suvorovii* and *P. anceps* are known; see notes to these species.

2. *P. Suvorovii* (Rgl.) Roshk. comb. n.—*Statice Suworowii* Rgl. in Tr. Bot. Sada, VII, 2 (1881) 550 and in Gartenfl. XXXI (1882) 289.—*S. spicata* β . *glabra* Rgl. in Izv. Obshch. lyubit. estestvozn., antrop. i etnogr. XXXIV, 2 (1882) 74 (Descr. pl. Fedtsch. No. 173).—*S. spicata* Kusn. in Mat. Fl. Kavk. IV, 1 (1903) 224, p.p. non Willd.; O. and B. Fedch. Perech. rast. Turk. V, 185 et auct. fl. turk. p.p.—*Limonium Suworovii* Ktze. Rev. gen. II (1891) 396.—Ic.: Rgl. Gartenfl. XXXI, tab. 1095 et XXXII, 342; Bot. Mag. CXIII, tab. 6959.

Annual, 10-50 (80) cm tall; leaves all radical, glaucescent-green, glabrous, oblanceolate to oblong-obovate in outline, 5-15 (20) cm long, 2-5 cm broad, quite glabrous (rarely) to rather deeply lobed and almost regularly and deeply (nearly to midrib) pinnatisect, the rounded-triangular
470 segments obtuse to subacute, slenderly mucronulate, the petiole rather short—scapes 1-5 (8), 2-3 (4) times the length of leaves, straight or slightly flexuous, terete and glabrous below, from first spike upward angled and with hairs becoming gradually denser upward, rarely simple, mostly in upper half to two thirds simply paniced, the terminal spike larger, (5) 10-20 (30) cm long and ca. 1-1.5 cm in diameter, the lateral spikes sessile or peduncled, (2) 5-10 (20) cm long, divergent from inflorescence axis and mostly upturned, clustered at the base of terminal spike or subdistant; spicules 2-4-flowered; bracts 2 in each spicule, pubescent on the back in upper part; outer bract 3-5 mm long, half as long again to twice as long as the inner bract, linear-subulate or slightly enlarged at apex and point-tipped, commonly very narrowly scarious-margined; inner bract much broader, broadly and irregularly obovate, concave inside, truncate at apex and usually with 3 fairly large membranous spicules, broadly scarious-margined; calyx ca. 3.5-4 mm long, funnelliform; calyx tube 10-ribbed in lower part, the ribs densely covered with rather long glandular hairs; calyx limb about as long as the tube, distinctly 5-lobed, the lobes very broadly triangular, acuminate, the nerves excurrent in aristate points ca. 1 mm long; corolla pink or bright pink, ca. 5-6 mm long, with ovate obtusish reflexed lobes. Fl. April-May (June); fr. May-June (Plate XXIII, Figures 3, 3a).

Saline argillaceous and sandy soils, in loess foothills and in plains.— Soviet Central Asia: Ar.-Casp. (extreme SE), Balkh. (extreme SW), Kyz. K., Kara K., Mtn. Turkm., Amu D., Syr D., Pam.-Al. (SW and NW low mountainous parts). **Gen. distr.:** Iran. (N. Afghanistan). Described from cultivated specimens, grown in the Petersburg Botanical Garden from seeds collected by A. Regel near the village of Dzhambulak in the Leninabad area. Type in Leningrad.

Note. The hybrid described below, *P. Suvorovii* × *P. leptostachya* is widely known.

× *P. myosuroides* (Regl.) Roshk. comb. n.—*Statice myosuroides* Rgl. in Izv. Obshch. lyubit. estestvozn., antrop. i etnogr. XXXIV, 2 (1882) 74 (Descr. pl. Fedtsch. No. 172); O. and B. Fedch. Perech. rast. Turk. V, 186.—*S. superba* Rgl. in Gartenfl. XXXVI (1887) 666, f. 170.—*Limonium myosuroides* Ktze. Rev. gen. II (1891) 395.—*L. superbum* Hubb. ex Bailey in Rhodora, XVIII (1916) 159.

- 471 Annual; in general appearance resembling *P. leptostachya*, but differing in the following characteristics: corolla markedly larger, ranging in color from pure white to dark pink; calyx larger, the tube 10-(not 5) ribbed, covered with denser and longer hairs, the limb distinctly funnelform, the awn-tipped lobes longer (though shorter than those of *P. Suvorovii*); distinguishable from *P. Suvorovii* by: leaves deeply and almost regularly pectinate-pinnatisect; inflorescence a slender, simple or more or less strongly branched spike; spicules in fascicles of 3 (as in *P. leptostachya*).

Occurring in places where *P. leptostachya* and *P. Suvorovii* grow together. Known from the following regions of Soviet Central Asia: Balkh. (SE part, Lake Biilyu-Kul' [or Biilikol']), Kyz. K. (middle course of Syr Darya R.), Mtn. Turkm. (Badkhyz), Syr D. (Golodnaya Steppe), Pam.-Al. (Vakhsh R. valley in the Kurgan-Tyube area, and Zeravshan R.). **Gen. distr.:** ? Iran. (? N. Afghanistan). Described from the vicinity of Lake Kosaral in the middle reaches of the Syr Darya River, in the area of Chordar village. Type in Leningrad.

Economic importance. *P. Suvorovii* is rather widely known as an ornamental annual for open ground. First introduced into cultivation about 1880 in the Petersburg Botanical Garden, whence it soon spread into the gardens of W. Europe and N. America. It is reported in the horticultural literature that this plant is very undemanding and easily grown. With consecutive plantings at different dates from February to April, it may flower from May to October (data for 50-60° N). × *P. myosuroides* was introduced into cultivation, also in the Petersburg Botanical Garden, and it often appears in foreign horticultural literature under the name *Statice superba* (or *Limonium superbum*), with several varieties differentiated by the color of flowers.

3. *P. spicata* (Willd.) Nevski in Tr. Bot. inst. AN SSSR, Ser. 1, IV (1937) 314.—*Statice spicata* Willd. Sp. pl. I (1797) 1532; M.B. Fl. taur.-cauc. I, 253; Boiss. in DC. Prodr. XII, 669; Ldb. Fl. Ross. III, 467; Boiss. Fl. or. IV, 871, p.p.; Shmal'g. Fl. II, 192; Kuzn. in Mat. Fl. Kavk. IV, 1, 224; p.p.; O. and B. Fedch. Perech. rast. Turk. V, 185, p.p.; Grossg. Fl. Kavk. ed. 1, III, 218.—*S. lyrata* M.B. Tabl. prov. Casp. (1798) 114 et Beschreib. Casp. (1800) 166 (No. 38).—

S. sisymbriifolia Jaub. et Sp. Illustr. pl. or. I (1842-1843) 158. — *Limonium spicatum* Ktze. Rev. gen. II (1891) 396; Grossg. Oprod. rast. Kavk. (1949) 593. — Ic.: Gmel. Fl. Sib. II (1749) tab. 91, f. 2; Jacq. Fragn. bot. (1809) tab. 125; Jaub. et Sp. l.c. tab. 87. — Exs.: Herb. Fl. Cauc. No. 96.

Annual, 10-40 (60) cm tall; leaves all radical, glaucescent-green, covered rather densely on the midrib and scatteredly on the lamina with
472 long flat crisp hairs, oblanceolate in outline, 5-15 cm long and 1-3.5 cm broad, almost regularly deeply (nearly to the midrib) pinnatisect, the segments irregularly triangular, obtusish, mostly reflexed and gradually diminishing toward base, the petiole fairly short; scapes commonly 1-10, rarely 15-20, 2-3 times the length of leaves, straight, terete below, angled in upper part, pubescent all the way up or rarely with an interruption in the middle part, in upper half to two thirds simply paniced with short branches; terminal spike 2-9 cm long and ca. 1 cm in diameter; lateral spikes 3-10 (20), sessile, shorter, sometimes subcapitate, 1-3 (7) cm long, more or less appressed to inflorescence axis, distant in lower part, congested at the top below the terminal spike; spicules 2-4-flowered; bracts 2 in each spicule, pubescent on the back in upper part; outer bract 2.5-3 mm long, equaling or slightly exceeding the inner bract, oblong-spatulate, in upper part ovately enlarged and cochlear inside, terminating in a point up to 1 mm long, narrowly scarious-margined; inner bract much broader, broadly and irregularly obovate, concave inside, truncate at apex, denticulately scarious-margined broadly at the sides and narrowly at apex; calyx ca. 3-3.5 mm long, funnelform; calyx tube in lower part 10-ribbed, the ribs herbaceous, densely studded with rather long glandular hairs; calyx limb about as long as the tube, distinctly 5-lobed, the lobes very broadly triangular acuminate, the nerves excurrent in aristate points ca. 0.5 mm long; corolla pale rose (or sometimes white?), ca. 4-4.5 mm long, funnelform, with ovate obtusish reflexed lobes. Fl. April-May (June); fr. May-June (Plate XXIII, Figures 5, 5a, 5b).

Saline argillaceous and sandy soils, in low foothills, on plains and along seacoasts. — European part: ? Crimea (a single specimen without precise indication of locality, not confirmed by more recent collections), L. V. (extreme S. — area around the lower reaches of the Kuma and Terek rivers); Caucasus: Dag., E. Transc., Tal.; Soviet Central Asia: Kara K. (from lower reaches of Atrek River to Ashkhabad), Mtn. Turkm. (low mountains of W. Kopet Dagh). **Gen. distr.:** Iran. (N. part, adjacent to Caspian). Described from the Caspian Sea coast, from the area of the villages of Melikent and Derbent (according to Gmelin). Type in London? (in the British Museum, in the Pallas herbarium?).

Economic importance. Rollov, Dikorastushchie r. Kavkaza, ikh rasprostanenie, svoistva i primenenie (1908) and Grossgeim, Rastitel'nye
473 resursy Kavkaza (1946) state that the roots yield a black, green, and yellow textile dye and may also be used for tanning. Larin, Kormovye r. estestvennykh senokosov i pastbishch SSSR (1937) classifies *P. spicata* as not eaten, or very little eaten, by livestock. The plant had been introduced into cultivation as an ornamental earlier than *P. Suvorovii* (more than 100 years ago), but was subsequently nearly forgotten.

4. *P. anceps* (Rgl.) Roshk. comb. n. — *Statice anceps* Rgl. in Izv. Obshch. lyubit. estestvozn., antrop. i etnorg. XXXIV, 2 (1882) 74 (Descr.

pl. Fedtsch. No. 174).—S. Alberti Rgl. in Tr. Bot. Sada, IX (1884) 615.—S. *spicata* O. et B. Fedtsch. Perech. rast. Turk. V (1913) 185 et auct. fl. turk. p.p. non Willd.—*Limonium anceps* Ktze. Rev. gen. II (1891) 335.

Annual, 5-25 (35) cm tall; leaves all radical, glaucescent-green, covered densely on the petiole and midrib and scatteredly on the lamina with long flat crisp hairs, the blade ovate or oblong-ovate or hastate in outline, 1-8 cm long and 0.5-3.5 cm broad, entire, broadly cuneate to subtruncate at base or often with few small obtuse auricular basal segments, rather gradually acuminate and terminating in a short slender point; petiole fairly long, about as long as or slightly longer than the blade; scapes 1-5 (15), 2-5 times the length of leaves, straight or slightly flexuous, terete and densely long-hairy in lower part, elsewhere rather broadly winged and glabrous, very rarely simple, mostly in upper half to two thirds simply paniced with short branches; terminal spike 1-4 cm long and ca. 1 cm in diameter; lateral spikes 3-13 (20), sessile or rarely short-peduncled, mostly much shorter to spherical, 0.5-2 (3.5) cm long, in lower part distant, in upper part congested at the base of the terminal spike and almost confluent with it; spicules 2-4-flowered, sessile; bracts 2 in each spicule, glabrous; outer bract 1-1.5 mm long, rather broadly rounded-triangular, about as broad at base as the inner bract, rather broadly scarious-margined, terminating in a slender point; inner bract half as long again to twice as long as the outer bract, broadly and irregularly obovate, concave inside, truncate at apex and terminating in a small herbaceous tooth, broadly scarious-margined; calyx 3.5-4 mm long, funnelform; calyx tube 10-ribbed in lower part, the ribs densely covered with rather long glandular hairs; calyx limb about as long as the tube, distinctly 5-lobed, the lobes very broadly triangular, acuminate, the nerves excurrent in aristate points ca. 1 mm long; corolla bright rose, ca. 5-6 mm long, the lobes ovate, 474 obtusish, reflexed. Fl. April-May; fr. May (Plate XXIII, Figure 4).

Saline argillaceous, sandy, or hammada soils, on plains.—Soviet Central Asia: Kyz. K. (extreme S.), Amu D. (N. part), Pam.-Al. (Lower Zeravshan R.). Endemic. Described from the Katta-Kurgan area. Type in Leningrad.

Note. A hybrid *P. anceps* × *P. leptostachya* is described below.

× *P. Androssovii* Roshk. hybr. n. in Addenda XVII, 749.

Annual; resembling in appearance *P. anceps*, but differing clearly in the following characteristics: leaves almost regularly pectinate-pinnatisect (as in *P. leptostachya*, but with much broader segments); scapes less strongly winged and more densely branched, with a more narrowly spicate inflorescence (though broader than in *P. leptostachya*) and a much longer central spike; flowers pale rose to nearly white, borne (as in *P. leptostachya*) in regular or nearly regular spiculiform fascicles, but only about half the size (corolla ca. 3.5 mm long; calyx ca. 2 mm long; awns of calyx lobes ca. 0.5 mm long).

Saline soils, together with *P. anceps* and *P. leptostachya*.—Soviet Central Asia: Kyz. K. (S. part), Amu D. (N. part). Endemic. Described from the vicinity of the town [stanitsa] of Kagan. Type in Leningrad.

Economic importance. Like *P. anceps*, × *P. Androssovii* is a very graceful and pretty plant that may be recommended, together with *P. Suvorovii*, for cultivation as an ornamental.

Order 33. **Ebenales** Engl.

Flowers with both calyx and corolla, actinomorphic, with sympetalous perianth; stamens in two whorls rarely one (by reduction) or more; ovary superior or semi-inferior, with central axile placentation, septate, each locule uniovulate or rarely biovulate. Trees or shrubs with simple leaves.

Family **SAPOTACEAE** DUMORT.

Genus **ACHRAS**

Achras pithecobroma Schimp. in Paleocene layers of L. V. (Mt. Ush); in the Eocene of L. Don (apparently Aidar R.)

Genus **BUMELIA**

Bumelia minor Ung. in the Oligocene of Poltava formation in V.-Don (Molotychi, Tim); in the Eocene of Mtn. Turkm. (Akarcheshme in Badkhyz).—*B. oreadam* Ung. in the Sarmatian layer of Bl. (Amvrosievka).—*B. subplejadum* Stanisl. in the Eocene of Buchak formation in U. Dnp. (Volyanshchina).

475

Genus **SAPOTACITES**

Sapotacites daphnes Ett. in the Eocene of Buchak formation in U. Dnp. (Volyanshchina).—*S. aff. mimusops* Ett. in the Eocene of Buchak formation in U. Dnp. (Volyanshchina).—*S. parvifolius* Ett. var. *major* Stanisl. in the Eocene of Buchak formation in U. Dnp. (Volyanshchina).—*S. Butterlickii* Ett. in Tertiary layers of W. Transc. (Goderzi).

Genus **TAENIOXYLON**

Taenioxylon porosum Felix in the Oligocene (Maikop rock suite) in E. Transc. (village of Bolsh. Perekyushkyl').

Family CXXVIII. **EBENACEAE** VENT*.

Flowers actinomorphic, dioecious, rarely bisexual or polygamous, 3-7-merous; calyx persistent and accrescent in fruit; corolla hypogynous or perigynous, convolute to the left in bud, deciduous; stamens at the base of corolla tube, alternating with and 1-2 times as many as corolla lobes or numerous, the filaments united at base in pairs or several; pistillate flowers usually containing only staminodes; ovary free, sessile, incompletely septate, 2-16-locular, each locule containing 1 or rarely 2 anatropous pendulous ovules, the integuments 2; styles distinct or basally connate; fruit a berry with one or few seeds; seed with copious cartilaginous endosperm and a straight axial embryo. Trees or shrubs with

* Prepared by V. I. Grubov.

heavy and hard wood, the heartwood often colored; leaves alternate, entire, estipulate; flowers axillary, solitary or in few-flowered cymose inflorescences.

A large family, with about 290 species, confined to the tropics and subtropics, chiefly in the eastern hemisphere (Southeast Asia, India, Malay Archipelago).

Genus **MACREIGHTIA**

Macreightia germanica Heer in the Pliocene of Pam.-Al. (Sary-Ob R. in Darvaz).

Genus 1143. **DIOSPYROS** L. *

L. Gen. pl. ed. V (1754) 1027.

Flowers dioecious, rarely monocious or polygamous, 4-5-merous; corolla campanulate or urceolate; staminate flowers with 4 to many, commonly 16, stamens in 2 whorls, the ovary obsolescent or absent; anthers 476 lanceolate, opening with longitudinal slits; staminodes in pistillate flowers 4-8 or sometimes none; ovary 4-16-, often 8-locular, with one ovule in each locule; styles 1-4-6, more or less coherent at base, with small capitate stigmas.

Of the approximately 200 known species of this genus, only two grow wild in the temperate zone of the northern hemisphere.

Species of the genus *Diospyros* occur in the USSR in geological strata ranging from upper Cretaceous to Miocene, as fossilized remnants, such as calyxes and leaves. Some earlier determinations of *Diospyros* species by O. Heer and I. Schmalhausen are incorrect and refer to the genus *Nordenskiöldia* of the family Trochodendraceae and have not therefore been listed here.

Diospyros anceps Heer in upper Cretaceous layers of the Ob region (Simonova); in the Eocene (Buchkak stage) of U. Dnp. (Mogil'no, Volyanshchina) and M. Dnp. (Katerinopol'); in the Eocene of Mtn. Turkm. (Lake Er-Oilan-Duz), in the Sarmatian of the Black Sea area (Amvrosievka); ? in Tertiary layers of Uss., Rechnoi peninsular); in Sarmatian formation of E. Transc. (Khvteebe monastery in E. Georgia). — *D. brachysepala* A. Br. in upper Cretaceous layers of the Ob region (Simonova); in the Sarmatian of E. Transc. (Khvteebe); Bl. (Amvrosievka) and Bes. (Lipkany); in the Tertiary of W. Transc. (Goderzi); in the Miocene of Transv. (Siditkullina); in the Oligocene of the Ob region (Tomsk); in the Oligocene of Uss. (Amagu R., Pos'et, Novokievskoe [Kraskino], Fatashi); in the Miocene of S. Transc. (Zanga R. [Razdan]); in the Eocene of Mtn. Turkm. (Lake Er-Oilan-Duz); in the Miocene of Cisc. (Crimean area); in the Pontic of W. Transc. (Guliani); in the Sarmatian of W. Transc. (Ungari R.); in the Konsko-Karagan of Guria (village of Chochkhaty); in the Pliocene of W. Transc. (Shiraki region); in the Tertiary layers of E. Transc. (Zanga R.); in the upper Sarmatian of Cisc. (Armavir). — *D. ficoides* Lesq. in the Paleocene of Ze.-Bu. (Raichika); *D. lotoides* Ung. in Tertiary layers of W. Transc. (Goderzi). — *D. lotus* in the upper Miocene (Chauda) of W. Transc. (Guria); in W. Trans. in Tertiary layers (village of Maidan), in Gurian layers (Tsikhir-perda); in Akchagyl layers (Shvind-Gelya Range) — *D. paradisiaca* Ett. in Mediterranean layers (Kemah R.) and Chokrak-Spirialis layers of Dag. (Khaivol-Dere). — *D. primaeva* Heer. in the upper Cretaceous layers of T. Sh. (Kyzyl-Dzhar [Petropavlovsk] in the Karatau Mts.). — *Diospyros* sp. in the Eocene of M. Dnp. (Katerinopol'); in the Eocene of Mtn. Turkm. (Akarcheshme in the Badkhyz area); in the Oligocene of Balkh. (Ashutas).

* From Greek dios = god, and pyros = fruit, i.e. "fruit (or food) of the gods".

1. Shoots with compact velutinous brownish pubescence; leaves coriaceous, large, oval, up to 8 cm broad, with 5 (6) pairs of lateral veins **D. kaki* L. f.
- + Shoots glabrous or with sparse grayish pubescence; leaves thin, oblong, up to 6 cm broad, with 7-11 pairs of veins 2.
2. Young branches reddish-brown or gray, with round orange lenticels and ovoid buds; leaves thinly coriaceous, very lustrous above, ciliate-margined, the slender petioles 1.5-2 cm long; flowers yellowish **D. virginiana* L.
- + Young branches yellowish-brown or pale yellow, with lanceolate white lenticels and lanceolate buds; leaves firmly membranous, slightly shiny above, never ciliate, the stout petioles up to 1.5 cm long; flowers yellowish-red or brownish-red 1. *D. lotus* L.

477 **D. kaki* L. f. Suppl. (1781) 439; Thunb. Fl. Japon. 157, excl. var.; DC. Prodr. VIII, 229, excl. var. *glabra*, non Blanco (Fl. Filip. ed. 1, 302).—*D. Schi-tse* Bge. Enum. Pl. China Bor. (1832) 42.—*D. chinensis* Blume Catal. Buitenz. (1823) 110.—Ic.: Bot. Mag. CXXXIII, tab. 8127.

Tree, up to 15 m tall, with gray bark; young branches brownish-gray or cherry-colored, with round gray lenticels; shoots, buds and inflorescence branches covered with brown velutinous pubescence; buds ovoid; leaves before shedding acquiring bright red tints, coriaceous, broadly oval, obovate, oblong-ovate, or elliptic, cuneately narrowed at base into the petiole, acuminate or strongly attenuated to a short beak or obtuse, 7-16 cm long, 4-8 cm broad, entire, dark green shining glabrous and smooth above, the lower surface grayish-green, reddish-pubescent especially on the veins, rarely glabrous, with strongly developed midrib and 5 or 6 pairs of lateral veins, these strongly recurved at the ends, the petioles ca. 1.5 cm long, stout, pubescent; flowers borne on pedicels 10-15 mm long, 4-merous, the staminate in 3-flowered half-umbels, the pistillate solitary and much larger than the staminate ones; calyx green, hairy outside, the segments oval or broadly lanceolate, spreading, inside below the ovary with a broad brownish velvety ring of hairs, in pistillate flowers to 25 mm in diameter; corolla yellowish-white, hairy outside, in staminate flowers urceolate, barely twice as long as the calyx, in pistillate flowers broadly campanulate, with oval reflexed lobes; stamens 16-24, hairy; staminodes in pistillate flowers 8-10; ovary 8-10-locular, with a hairy 4-parted style; fruit a large fleshy 8-10-seeded berry, usually more than 3 cm in diameter; light orange to dark red, faintly pruinose, varying in shape, size, number of seeds, and consistency. Fl. May; fr. September-November (Plate XXIV, Figure 3).

The original habitat of this species is North China where it grows in broad-leaved woods. Long ago introduced into cultivation and widely distributed through the countries of eastern Asia.

In the USSR, cultivated in the Caucasus all along the Black Sea coast from Gelendzhik to Batumi, Azerbaijan and the mountainous part of Dagestan, Krasnodar Territory, south coast of the Crimea, and Soviet Central Asia (Ashkhabad, Firyuza, Samarkand).

Described from cultivated specimens originating from Japan. Type lost.

Economic importance. The fruit of this persimmon has an excellent taste and is one of the best dessert fruits. The fruits have a high sugar

478 content (up to 25% in fresh and up to 62% in dried condition) and are outstandingly palatable. They have, moreover, a high nutritional value, as they contain much iron; sugars are present in the form of glucose and fructose. Certain varieties compare favorably in vitamin C content with the Unshiu variety of mandarin.

The fruits are also very widely used in a dried state, in candies, preserves, jams, etc., and for the production of syrups and alcoholic drinks. In Japan, varieties are available with a high tannin content in the fruits, and their extract is employed as an efficient agent for the tanning of hides and for impregnation of wood and fishing nets, as well as for the manufacture of varnishes and dyes.

Note. Cultivated in China and Japan since remote antiquity, as witnessed by the wide distribution in cultivation throughout Southeast Asia and the immense number of varieties of which more than 1000 are known. Persimmon trees are very widespread in the countries of Southeast Asia, more particularly in China and in Japan, where they provide a favorite fruit and one of the components of daily diet of the population. The fruit is grown on an industrial scale in the northern provinces of China, and this area serves as a depository of the best varieties. Persimmon was introduced into Japan in ancient times and it found there its second habitat.

Europeans had become acquainted with persimmon at the beginning of the 17th century from descriptions of Jesuit travellers in China, but no attempts at introduction into Europe had been made until the 1870's when persimmon trees were first planted in the south of France and then in Italy and Algeria.

Until recently the cultivation of *Diospyros kaki* did not receive any serious attention, owing to the lack of familiarity of Europeans with its growing. However in 1913, when high-quality nonastringent varieties were obtained, *Diospyros kaki* began to be grown on a commercial scale, while the fruits have been gaining considerable popularity among consumers.

In the USSR, persimmon made its first appearance in 1889, when it was brought from France to the Caucasus (Sukhumi). For a long time, owing to the lack of good varieties, the tree remained within the province of experimentors and fanciers.

Now that, owing to systematic study and experimentation, varieties are available that are fully nonastringent (even in green condition) and have other requisite qualities, while ways and means are at hand to grow the tree in the USSR, *Diospyros kaki* has good prospects of becoming a
481 commercial fruit tree. It is the most frost-resistant of all subtropical fruit trees. Some of the varieties existing in the USSR stand up in its climate to freezing temperatures as low as -14°C , and there are varieties in China that are capable of resisting without damage temperatures well below -20° (the northern cultivation limit of persimmon in China reaches beyond Peking).

1. *D. lotus* L. Sp. pl. (1753) 1057; Shmal'g. Fl. II, 202; Vol'f and Palib., Opred. der. i kust. 281; Med. Der. i kust. Kavk. (1919) 200.—*D. Kaki* var. *glabra* DC. Prodr. VIII (1844) 229.—Ic.: Pall. Fl. Ross. I, tab. 58 et 59, f. infer.; Rchb. Ic. Fl. Germ. XVII, tab. 1079.—Exs.: GRF, No. 1784; Fl. cauc. exs. No. 124.

Tree, up to 15 or rarely 20 m tall, the trunk up to 35 cm in diameter, with dark gray splitting bark; young branches light yellowish-brown or gray, smooth, with whitish lanceolate lenticels; shoots glabrous and covered with



1. *Diospyros virginiana* L.—2. *D. lotus* L.—3. *D. kaki* L.f.

grayish pubescence; buds lanceolate; leaves shed without change of color, firmly membranous, oblong-elliptic to broadly lanceolate, broadly cuneate or rounded at base, acuminate or abruptly narrowed to a point, 5-14 cm long and 2.5-6 cm broad, entire and often undulate-margined, bright green above, the lower surface grayish-green, sparsely pubescent especially on the main veins, sometimes glabrate, with a prominent midrib and 7-10 pairs of lateral veins and a faint network of veins of third and fourth order, the petiole 1-1.5 cm long, stout, compactly pubescent; flowers subsessile, 5-8 mm long, 4- or rarely 5-merous, the staminate in cymes of 2 or 3, the pistillate solitary and larger than the staminate; calyx green, hairy outside, inside with a rosy compactly velvety ring of hairs, the segments broadly triangular acute; corolla yellowish-red to brownish-red, in staminate flowers urceolate and about twice as long as the calyx, in pistillate flowers campanulate, with reflexed lobes; stamens commonly 16, hairy, with short filaments; staminodes in pistillate flowers 8; ovary 8-locular, hairy at the top, the style 4-6-parted; fruit a spherical 2-8-seeded fleshy berry, 8-16 mm [sic] in diameter, initially, turning blackish-brown, pruinose. Fl. May, June; fr. October-November (Plate XXIV, Figure 2).

In mixed mountain forests, at altitudes up to 1500 m, escaped from cultivation. Cultivated.—European part: Crimea (S. coast, cult.); Caucasus: W., E. and S. Transc., Dag (S.), Tal. (considerable stands in Lenkoran Lowland area); Soviet Central Asia: Mtn. Turkm., Amu D., Syr D. (Fergana); Pam.-Al. (Darvaz, Gissar). **Gen. distr.:** Med., Bal.-As. Min., Arm.-Kurd., Iran., Ind.-Him., Jap.-Ch. Described from S. France (Languedoc). Type in London.

482 **Economic importance.** Imperfectly ripe fruits (as in the other species referred to below) are tart and astringent because of the high tannin content. Fully ripe fruits, however, when they have already been touched by frost, loose their astringency and become palatable; they are rich in sugar (up to 40% in dry state) and they compare favorably in taste with dates. In fresh condition, in the form of various candies, jam ("Bekmez" in the Caucasus). and as dried fruit, they are widely used by the local population (especially in Iran and Afghanistan) for food and for the production of syrup, wines, and brandy. Seedlings of this species provide a satisfactory rootstock for the Japanese persimmon and are commonly used for this purpose in our hemisphere. A handsome ornamental tree, an excellent support for grapevines, and a nectariferous plant. The firm, durable, pliable, yellow-colored wood, known as "green ebony wood", is employed in various ways in carpentry and joinery, it is made into shuttles for the textile industry, and also provides good rot-resistant building material. Known in Europe as a fruit tree since ancient times and mentioned by Homer and Theophrastus.

Note. The habitat of this species is NE China, whence it spread in cultivation westward as far as Spain and subsequently turned wild.

***D. virginiana** L. Sp. pl. (1753) 1057; DC. Prodr. VIII, 229; Britt.a. Br. Ill. Fl. N. Am. (1913) 720; Sargent, Silva of N. Am. VI, 7.—**D. pubescens** Pursh, Fl. N. Am. I (1814) 265, non Pers.—**D. ciliata** Rafin, New. Fl. a. Bot. N. Am. III (1836) 25, non DC.— **Ic.:** Sargent, l.c. tab. 252, 253; Belg. Hort. IV (1854) 118.—**Exs.:** Curtis, North American Plants, No. 1758.

Tree, up to 30 m tall, the trunk up to 40-45 cm in diameter; with thick deeply splitting dark gray or brown bark; young branches reddish-brown or grayish-brown, with round orange lenticels; shoots commonly sparsely gray-puberulous; buds ovoid; leaves shed without change of color, subcoriaceous, oval or ovate or elliptic, alternate, broadly cuneate or cordate at base, short-acuminate or attenuated to a point or obtuse, 5-12 cm long and 2.5-6 cm broad, entire, ciliate-margined, the upper surface dark green, strongly lustrous, smooth, glabrous or rarely with scattered hairs, the lower surface glaucous-green, pubescent especially on the veins or sometimes quite glabrous, with 7-10 pairs of lateral veins and a distinct network of dark veins of third and fourth order, the slender petioles 1.5-2 cm long; flowers commonly 4-merous, borne on pubescent pedicels ca. 10-12 mm long, the staminate in 2- or 3-flowered dichasia, the pistillate solitary and larger than the staminate; calyx green, hairy outside, with lanceolate acute segments and a yellow velvety ring of hairs below the
483 ovary; corolla pale yellow or greenish-yellow, in staminate flowers tubular-urceolate, twice as long as the calyx, in pistillate flower campanulate, with round reflexed lobes; stamens mostly 16, hairy; staminodes in pistillate flower 8; ovary 8-locular, hairy at the top, with a 4-parted style; fruit a spherical 3-8-seeded fleshy berry up to 25-30 mm in diameter, light orange to red, pruinose. Fl. April-May (June); fr. September-November (Plate XXIV, Figure 1).

Growing wild in woods and in river valleys in the eastern states of the U.S.A., from Connecticut to Iowa and from Kansas to Florida. In the USSR in small stands or as isolated trees in Transcaucasia (in areas where Japanese persimmon is cultivated) and in Soviet Central Asia (Ashkhabad, Kara-Kala, Tashkent). Described from North America. Type in London.

Economic importance. A frost-resistant species of persimmon, spreading far to the north. As regards properties and uses, it corresponds to the Caucasian persimmon. In addition, the fruits of wild-growing trees are used as fodder for livestock. A bark infusion is considered as excellent agent against diarrhea, dysentery, and intermittent fever; in combination with alum, it is also used for gargling against throat ailments. The wood is firm, durable, resilient, with dark brown heartwood; it is widely used in the manufacture of furniture, musical instruments, shuttles for the textile industry, etc. Good nonfading inks are made out of green fruits.

During the last ten years, improved varieties of Virginian persimmon have been produced, with large, completely nonastringent tasty fruits. The tree is beginning to gain wide popularity and is entering into intensive cultivation. Seedlings of this species provide the common rootstock for Japanese persimmon, but in this respect they are inferior to common persimmon.

Virginian persimmon was first introduced from America into England, at the beginning of the 17th century, and later began to be grown on a small scale in southern Europe. In the USSR it seems to have appeared at the same time as Japanese persimmon, but it did not spread because of the pronounced astringency of the fruits, even though this shortcoming disappears when the fruit has been touched by frost.

Note. All three species are closely related and they cross readily.

Family CXXIX. **OLEACEAE** LINDL*.

Flowers bisexual, dioecious, or polygamous; calyx persistent, mostly small, with 4 or rarely many teeth or segments, or rarely calyx absent; corolla gamopetalous, patelliform, infundibular, campanulate, or
 484 polypetalous with petals united with filaments, or corolla absent; petals or corolla lobes 4, rarely 5 or 6; stamens 2, rarely 3-5, the filaments adnate to corolla tube or petals, or (when corolla absent) stamens distinct, hypogynous; filaments mostly short; anthers attached dorsally, near the base or rarely near the apex, the connective apiculate or obtuse; disk absent; ovary bilocular; style mostly short, sometimes elongated; stigma thickened or capitate or mostly shortly biparted; ovules in each locule 2, rarely 1 or 4-10, pendulous or erect, anatropous or campylotropous; fruit a bilocular 2-valved capsule, samara, berry, or drupe; seeds 2-4 or mostly 1; endosperm fleshy or nearly so, often oily, or absent; embryo straight, with inferior or superior radicles. Trees or shrubs upright or scandent; leaves estipulate, deciduous or evergreen, simple or trifoliate or pinnate, opposite or whorled or alternate.

The family contains 22 genera and about 400 species, distributed chiefly through the tropical and subtropical regions. In the USSR there are 6 genera (not counting the genus *Olea* cultivated in a number of places in S. Crimea and Transcaucasia) and 27 species, not counting cultivated ornamentals.

The family Oleaceae contains a large number of highly decorative trees and shrubs which enjoy an established reputation. Certain species of the genus *Fraxinus* are of interest on account of the high quality of their wood that has varied industrial applications. Olive fruits yield valuable oil for food industry and technology. Some representatives of the family are considered as medicinal plants.

Key to Genera

1. Leaves alternate, pinnate, with 3-9 leaflets; shrubs with green branches. Genus 1150. **Jasminum** L.
- + Leaves opposite or whorled 2.
2. Leaves simple, entire or dentate, rarely pinnate 3.
- + Leaves trifoliate or pinnate 7.
3. Leaves evergreen, thick, coriaceous. 4.
- + Leaves deciduous, relatively thin to membranous 5.
4. Lower leaf surface silvery glandular. Genus 1147. **Olea** L.
- + Lower leaf surface glabrous or hairy. Genus 1146. **Phillyrea** L.
- 485 5. Fruit a bilocular capsule 6.
- + Fruit a berry Genus 1149. **Ligustrum** L.
6. Corolla tubular or funnelform; stamens included in corolla tube.
- Genus 1145. **Syringa** L.
- + Corolla rotate, with a short tube; stamens strongly exerted from corolla tube Genus 1148. **Ligustrina** Rupr.
7. Calyx and corolla always present; corolla 5-lobed; fruit a berry.
- Genus 1150. **Jasminum** L.

* Prepared by V. N. Vasil'ev, except for the genus *Olea* L., the latter prepared by A. G. Borisova.

- + Calyx and corolla not always present; petals 4-6, not united; fruit a samara. Genus 1144. **Fraxinus** L.

Genus 1144. **FRAXINUS** * L.

L. Sp. pl. (1753) 1057.

Flowers in terminal or lateral paniculate inflorescences rarely subtended by leaves, polygamous, unisexual, or dioecious; calyx small, 4-toothed or irregularly cleft, or absent; petals 4, rarely 6 or 2, slightly united at base, rarely higher up, occasionally absent; stamens 2, rarely more, adnate at base to corolla, the anthers cordate-ovate; style short or oblong, the stigma biparted; ovules 2 in each locule, pendulous; fruit a unilocular samara; seeds elongate-ovaloid, thin-coated, the endosperm fleshy, the embryo with flat leafy cotyledons. Trees or tall shrubs; leaves opposite, estipulate, irregularly pinnate, very rarely simple; leaflets thin, membranous or coriaceous, serrate, dentate, or rarely entire; buds fairly large.

Distributed through the temperate and rarely the subtropical and tropical zones. According to Lingelsheim, the genus contains 64 species; this figure is apparently low, as this author presented many good species as varieties. In the USSR there are 14 species, including three introduced into cultivation from North America.

Economic importance. The wood of the larger species of ash has excellent technological properties and is used in plywood manufacture, carpentry, airplane construction, etc.

Species of the genus *Fraxinus* appear in the USSR from the beginning of the Paleocene. The finds from Paleocene and Eocene are very dubious, while later ones, being confirmed by fruit remnants, are fully reliable.

486 *Fraxinus excelsior* L. in interglacial layers of U. Dnp. (Grodno, Samostrel'niki, U.V. (Troitskoe), V.-Don (Likhvin), V.-Ka. (Galich); in Quaternary layers of Cisc. (tuffs in Zheleznovodsk); in Akchagyl layers of Cisc. (Sunzhenskii Range).—*F. juglandina* Sap. (conditionally) in the Oligocene of Uss. (Rechnoi village).—*Fr. cf. pennsylvanica* Marsh. in Tertiary layers of Uss. (Alekseevka, Khanka area, wood according to determination by A. V. Yarmolenko).—*F. Ornus* L. in Tertiary layers of Alt. (Chingistai).—*F. yukonensis* Holl. in the Paleocene of Kamch. (Napana R., Kavachina).—*Fraxinus* sp. in the Pliocene diatomite deposits of E. Transc. (Bazar-Chai R. [Vorotan]); in interglacial layers of V.-Ka. (Galich); in the Oligocene of Balkh. (Ashutas); in the Pliocene of T. Sh. (Lake Issyk-Kul'); in the upper Miocene of Ob region (Ekaterinskoe on the Irtysh); in Tertiary layers of Kamch.; in the Sarmatian (?) layers (vicinity of Armavir); V.-Don (Embulatova, Tatar ASSR, wood according to determination by A. V. Yarmolenko).

1. Inflorescences terminal or if axillary then borne in the axils of current year's leaves; flowering with or after leaves (subgenus *Ornus* (DC.) V. Vasil.). 2.
- + Inflorescences lateral, borne in the axils of preceding year's leaves (subgenus *Fraxinaster* (DC.) V. Vassil.) 4.
2. Flowers with calyx and corolla, appearing after leaves; filaments of stamens long; panicles terminal, many-flowered (Soviet Central Asia and Mediterranean region). 3.

* The name is usually thought to be derived from the Greek *fraxis* = to divide, referring to the wood being easily cleaved or its being used for erection of fences and thus dividing land; it is also possible that the actual derivation is from Latin *frangere* = to break, alluding to the fragility of ash branches.

- + Flowering with leaves; corolla wanting; samara narrow, long, enlarged at the top, obtuse or emarginate at apex 3. *F. rhynchophylla* Hance.
3. Panicles small; fruits falcate; leaves with 1 or 2 or rarely 3 pairs of entire leaflets 2. *F. raibocarpa* Rgl.
- + Panicles large and dense; fruits straight; leaves with 3 or 4 pairs of serrate leaflets 1. *F. ornus* L.
4. Flowers with calyx; fruits wingless below 5.
- + Flowers without perianth; fruits winged nearly down to base 7.
5. Young branchlets and leaf veins glabrous or slightly hairy 6.
- + Young branchlets tomentose; leaf veins hairy **F. pennsylvanica* Marsh.
6. Young branchlets and leaf veins glabrous; samaras 2-5 cm long, the body half to slightly less than the total length . . . **F. lanceolata* Borkh.
- + Young branchlets slightly hairy; samaras 2.4-3.4 cm long, the body less than half the total length ; **F. americana* L.
7. Inflorescences paniculate, solitary or mostly several in the axils of preceding year's leaves. 8.
- 487 + Inflorescences racemose, always solitary in the axils of preceding year's leaves. 12.
8. Leaflets covered beneath, especially on the veins, with soft rufous pubescence; branchlets of the current year densely pubescent 9.
- + Leaflets glabrous on both sides or pubescence confined to midrib beneath. 10.
9. Leaves with 4-6 pairs of leaflets; samara oblong-lanceolate, enlarged at the top, obtuse or emarginate, up to 3.5 cm long and 0.7-0.9 cm broad; leaf petiole half as long as the blade 6. *F. coriariifolia* Scheele.
- + Leaves with 2-5 pairs of leaflets; samara narrowly elliptic to elliptic-lanceolate, round-tipped, or acuminate 3-4.5 (7) cm long and 6-10 (19) cm broad 7. *F. Pallisae* Willm.
10. Paniculate inflorescences several in the axil of each leaf 11.
- + Paniculate inflorescences solitary in leaf axil or accompanied by several short racemose inflorescences 9. *F. oxycarpa* Willd.
11. Fruit 2.8-3.5 cm long, up to 9 mm broad; young branchlets stoutish, with dark yellow bark and verrucose-punctate (Far East) 4. *F. mandschurica* Rupr.
- + Fruit (2.7) 3.3-4.5 cm long, 0.7-1 cm broad; young branchlets pale gray, a greenish-tinged (European part) 5. *F. excelsior* L.
12. Inflorescence long, slightly nodding; leaflets 1-4 pairs, sessile or subsessile 13.
- + Inflorescence short, not nodding; leaflets 3-5 pairs, petiolulate. 12. *F. sogdiana* Bge.
13. A small tree or shrub; leaflets 1-3 pairs, very distant, narrow; samara 2.5-3.3 (4) cm long, acuminate or rarely obtusish. 10. *F. angustifolia* Vahl.
- + Large trees; samara obtusish or emarginate 14.
14. Rachis of raceme up to 12 cm long; samara elliptic, 2-3.5 cm long, 0.7-1 cm broad, obtusish or emarginate, the body more than half the total length 8. *F. syriaca* Boiss.

- + Rachis of raceme 2-4-6 cm long; 3.5-5 cm long, enlarged at the top, emarginate, the body half the total length. 11. *F. Pojarkoviana* V. Vassil.

Subgenus 1. **ORNUS** (DC.) V. Vassil. comb. n.—Sect. *Ornus* DC. in DC. et Lam. Fl. franc. ed. 3, III (1805) 496; Prodr. VIII, 274.—

488 Inflorescences terminal and if axillary then borne in the axils of current year's leaves; calyx 4-toothed; corolla of 2-4 petals or none; stamens in pistillate flowers 2-4 or wanting, in staminate flowers 2; flowering with or after leaves.

Section 1. **EUORNUS** (Koehne et Lingelsh.) V. Vassil. comb. n.—Subsect. *Euornus* Koehne et Lingelsh. in Mitt. Deutsch. Dendrol. Ges. (1906) 66.—Petals present; flowering after leaves; calyx minute, campanulate, 4-toothed; petals 4 or rarely 2, much longer than the calyx; stamens with long filaments; samara light brown, the lower part convex and round; the wings thin; panicle terminal, open, many-flowered.

Series 1. *Rotundifoliae* V. Vassil.—Leaflets orbicular or ovate or obcordate, abruptly terminating in a short point or obtuse.

Note. Beside *F. ornus* and *F. raibocarpa*, this series contains *F. rotundifolia* DC. (Balkan Peninsula), *F. cilicica* Lingelsh. (central part of the Mediterranean region), and *F. Kotschyi* C.K. Schn. (eastern part of the Mediterranean region).

1. *F. ornus* L. Sp. pl. (1753) 1057; DC. Prodr. VIII, 274; Boiss. Fl. or. IV, 39; Kuzn. in Mat. Fl. Kavk. IV, 235; Lingelsh. in Engl. Bot. Jahrb. XL, 212 et in Pflanzenr. IV, 243, I and II, 16.—*Ornus europaea* Pers. Syn. pl. I (1805) 9.—Ic.: Rchb. Ic. Fl. Germ. XVII, tab. 31; Dippel, Laubholz. I (1889), f. 33; Engl.—Pr. Pflanzenf. IV, 2, f. 3; Lingelsh. l.c. f. 2, A-E.—Exs.: Sint. et Bornm. It. turc. 1891, No. 1366; Koehne, Herb. dendr. No. 319; Rchb. exs. No. 339; Petter, Fl. dalm. exs. No. 176.

Tree, up to 4-5 m tall; leaflets 3 or 4 pairs, on short petiolules or subsessile, very variable in shape and size, 4-10 cm long, 2-4 cm broad, orbicular or obovate or ovate, round-based, abruptly terminating in a short point or obtuse, minutely serrulate or denticulate, rufous-pilose on the midrib beneath, rarely quite glabrous; panicle many-flowered; calyx 4-parted, the segments broadly triangular; petals narrowly linear, acuminate, several times the length of calyx; samara linear or lanceolate, 2-3 cm long, 0.4-0.5 cm broad, obtuse or emarginate, the body convex. Fl. April; fr. August.

Sometimes grown in parks.—European part: Crim.; Caucasus: E. Transc. **Gen. distr.:** Centr. Eur., Med., Bal.-As. Min., Arm.-Kurd. Described from Europe. Type in London.

489 2. *F. raibocarpa* Rgl. in Tr. Bot. Sada, VIII (1884) 685; Dippel, Laubholz. I (1889) 93; Lingelsh. in Engl. Pflanzenr. IV, 243, I. II, 19; Fedch. and Nekr. in Tr. po prikl. bot. ser. X, 2, 39.—Ic.: Rgl. l.c. tab. XII; Dippel, l.c.f. 50; Fedch. l.c. 645; Lingelsh. l.c.f. No. 4, A.B.

Shrub; leaves imparipinnate with 1 or 2 or rarely 3 pairs, petiolate, 5-15 cm long, 4-10 cm broad, the petiole flattened, canaliculate above, convex beneath; leaflets ovate to oblong-ovate, petiolulate, 2-10 cm long, 1-5 cm broad, mostly obtusish, rarely acuminate or emarginate, the upper pair subsessile, the lower minutely petiolulate, the terminal long-petiolulate, all entire, coriaceous, with a prominent network of veins on the lower surface, slightly pubescent beneath when young, glabrous above; panicle terminal, loose, branched, leafy, equaling or slightly exceeding the leaves; flowers bisexual; calyx of 4 united sepals, persistent in fruit; corolla tube as long as calyx; petals 4, lanceolate, 3 times the length of calyx, deciduous; fruit a falcate samara, topped by a broad spatulate entire obtuse or rarely acutish wing, 2.5-3 cm long, up to 1-1.4 cm broad in wing. Fl. end May-early June; fr. July-August (Plate XXV, Figure 5).

Woods in mountain river valley and valley slopes, at altitudes from 1000 to 3000 m. — Soviet Central Asia: Pam.-Al. Endemic. Described from Darvaza Range, Type in Leningrad.

Section 2. **ORNASTER** (Koehne et Lingelsh). V. Vassil. comb. n. — Subsect. *Ornaster* Koehne et Lingelsh. in Mitt. Deutsch. Dendrol. Ges. 15 (1906) 66. — Petals wanting.

Series 2. **Chinenses** V. Vassil. — Leaflets broad, terminating in an oblique elongated point; flowering with leaves.

Beside *F. rhynchophylla* Hance, the series contains *F. chinensis* Roxb., *F. yunnanensis* Lingelsh., and *F. Sargentiana* Lingelsh. of China and Japan.

3. *F. rhynchophylla* Hance in Journ. Bot. 7 (1869) 164; Kom. Fl. Man'chzh. III, 248; C.K. Schn. Laubholzsk. II, 820; Nakai, Fl. sylv. Koreana, X, 24; Kom. and Alis., Opred. rast. Dal'nevost. kr. II, 854. — *F. chinensis* var. *rhynchophylla* Hemsl. in Journ. Linn. Soc. XXVI (1889) 86; Lingelsh. in Engl. Pflanzenr. IV, 243, I and II, 29. — Ic.: C.K. Schn. l.c. tab. 516, fig. c. tab. 518, fig. a-e; Nakai, l.c., tab. 4; Kom. and Alis., Plate 260; Lingelsh, l.c.

490 Dioecious or rarely polygamous tree, with polygonally splitting light brown, brownish-gray, or dark gray bark, up to 12-18 m tall, [the trunk] not more than 0.5 m thick; branches spreading; branchlets annual, smooth, dingy grayish-brown with minute light lenticels; branchlet of the current year brownish-green or reddish- to brownish-green or sometimes grayish-brown; buds broadly ovaloid, short, with rufous or rarely whitish pubescence; leaves imparipinnate; leaflets 1-3 pairs, short-petioluled, on sterile branchlets rounded-oval to broadly oval, on fertile branchlets obovate, elliptic-oblong, broadly lanceolate, or broadly oblanceolate, abruptly narrowed to a long or mostly short point, rarely muticous, with anastomosing lateral veins, coarsely crenate or rarely entire, glabrous and green above, pale glaucescent beneath, the dense and rather long rufous hairs covering the sides of midrib, the base of lateral veins and partly the petiole, the rufous hairs at petiole base sometimes forming a complete ring; racemes congested, axillary or subterminal or terminal, glabrous; pedicels long and slender; calyx 4-lobed or 4-toothed or nearly entire, broadly

campanulate, glabrous, persistent; staminate flowers with 2 stamens; perfect flowers with 2 (4) stamens and ovary; style with biparted stigma; samara 3.3-3.7 cm long, 0.5 cm broad, enlarged and rounded at the top, truncate or rarely slightly emarginate or acuminate, often topped by the stigma; the body much less than half the total length. Fl. mid June; fr. September (Plate XXV, Figure 9).

Mixed woods on slopes.— Far East: Uss. (S.), Sakh. (S.). **Gen. distr.:** Manchuria, Korea, N. China, Japan. Described from N. China. Type in London.

Note. Nakai (l.c.) records that perfect flowers of this species have 2-4 petals in addition to calyx.

Subgenus 2. **FRAXINASTER** (DC.) V. Vassil. comb. n.— Section *Fraxinaster* DC. Prodr. VIII (1844) 276.— Flowers always lateral, borne in axils of preceding year's leaves.

Section 3. **MELIOIDES** (Endl.) V. Vassil.; Endl. Gen. pl. ed. 1 (1836-1840) 573, sub "b" *Melioides*.— Flowers with calyx, without corolla.

***F. lanceolata** Borkh. Handb. Forstbot. (1800) 826.— *F. viridis* Mchx. Hist. d. Arbr. For. III (1813) 115.— *F. concolor* Mühl. Cat. pl. Am. sept. (1813) 101.— *F. pennsylvanica* var. *lanceolata* Sarg. Silv. N. Am. VI (1894) 50.— Ic.: Mchx. l.c. tab. 10; Sarg. l.c. tab. 272.

491 Tree, 30-50 m tall; young branchlets glabrous; leaflets 2 or 3 pairs, oval or oblong, acuminate, entire or serrate or crenate, paler beneath, 5-18 cm long, 2-9 cm broad, smooth above, with scattered whitish hairs on the veins beneath, short-petioluled; calyx in staminate inflorescences small, deeply 4-parted; pistillate flowers in broad lateral panicles, with short and broad short-incised calyx; samara narrowly spatulate or linear, obtuse or emarginate, 2-5 cm long, 0.3-0.5 cm broad, the body convex, half the length of to nearly as long as the whole samara, brown. Fl. May; fr. second half of August-September.

Originating from North America. Since 1723 introduced into cultivation in Europe. Grown in gardens and parks in many areas of the USSR (from Maritime Territory to the Carpathians inclusive, except Siberia) for its high ornamental value. Valuable for afforestation. Widely used for protective planting.

***F. pennsylvanica** Marsh. Arb. amer. (1785) 95; Willd. Enum. pl. hort. Berol. 68; Sarg. Silv. N. Am. VI (1894) 49; id. Man. Trees N. Amer. (1905) 770; Lingelsh. in Engl. Bot. Jahrb. XL, 220; in Engl. Pflanzenr. IV, 243, I and II, 41.— *F. pubescens* Lam. Encycl. meth. II (1786) 543; Dippel, Laubholz. I, 76.— *F. americana* subsp. *pennsylvanica* Waesmael in Bull. soc. bot. Belg. XXXI (1892) 109.— *F. viridis* Mchx. Hist. Arb. For. Am. Sept. (1813) 115.— Ic.: Sarg. l.c. (1894) tab. 271; Dippel, l.c.f. 39; Mchx. l.c. tab. 10.

Tree, 16-48 m tall; buds brown; young branchlets of current year's growth; leaf rachis and leaflets velutinous-pubescent beneath or glabrate (var. *viridis* (Mchx.) C.K. Schn.); leaves 10-40 cm long; leaflets

2-4 pairs, very variable in shape, 4-13 cm long, 2-8 cm broad, short-petioluled or subsessile, oval to oblong, often apiculate, entire or minutely denticulate; panicles 5-20 cm long; calyx campanulate, rather regularly toothed, loosely adhering to fruit; samara spatulate, gradually enlarged from base, rounded or slightly pointed at the top, 3-7 cm long, 0.5-1.2 cm broad, wingless in lower half, the body much shorter than the samara. Fl. April; fr. August.

Originating from North America, where it grows on the shores of rivers and lakes. A beautiful ornamental tree. Grown in gardens and parks in many parts of the USSR: European part, Far East, Kazakhstan. Employed on a large scale in afforestation and also used for protective planting.

***F. americana** L. Sp. pl. (1753) 1057; Wenzig in Engl. Bot. Jahrb. IV, 180; A. Gray, Syn. Fl. N. Amer. II, 1, 75; Dippel, Laubholzsk. I, 74; Sarg. Silv. N. Amer. VI, 43; Lingelsh. in Engl. Bot. Jarb. XV, 219; C.K. Schn. Laubholzsk. II, 824; Lingelsh. in Engl. Pflanzenr. IV, 243, I, 37.— **F. juglandifolia** Lam. Encycl. II (1790) 548.— **F. americana** 492 var. **juglandifolia** Rehd. in Bail. Cycl. Amer. Hort. II (1900) 607; C.K. Schn. l.c. 824.— **F. epiptera** Mchx. Fl. bor.-amer. II (1803) 256.— Ic.: Mchx. Hist. Arbr. For. III, tab. 8; Dippel, l.c.f. 37, I, II; Sarg. l.c. tab. 269; C.K. Schn. l.c. tab. 519, a-b.

Tree, up to 40 m tall, with a broad ovoid top; branchlets glabrous, only the very young slightly hairy, initially greenish-brown with reddish hue, becoming light orange or lustrous brown, often glaucous; buds blackish; leaves up to 30 cm long; leaflets 7 (5-9), entire or dentate (var. **juglandifolia**), oblong-elliptic or oblong-ovate, up to 15 cm long, 5 cm broad, with petiolules 4-8 mm long, the upper surface dark green with a concave network of veins, the lower surface pale green, alveolate or smooth (var. **juglandifolia**); flowers dioecious; pistillate inflorescences up to 10 cm long; staminate inflorescences short and dense; calyx fairly pronounced; samaras 2.4-3.4 cm long, the body half the total length, cylindric, wingless. May.

Originating from North America (Nova Scotia, Minnesota to Florida). The variety used most for protective belts in the USSR is var. **juglandifolia**. Suffering greatly from pests.

Section 4. **BUMELIOIDES** (Endl.) V. Vassil.— Subsect. **Bumelioides** Endl. Gen. pl. ed. 1 (1836-1840) 573.— Flowers without calyx and without corolla, dioecious or bisexual; staminate flowers with 2 stamens; flowering with leaves

Series 3. **Excelsiores** V. Vassil.— Flowers borne in the axils of preceding year's leaves in paniculate or partly paniculate and partly racemose inflorescences; flowers polygamous, without calyx and without corolla; leaflets stomatiferous on lower surface.

4. **F. mandschurica** Rupr. in Bull. Phys. math. Acad. Petersb. XV (1857) 371; Maxim. Prim. fl. amur. 194 et in Mel. biol. IX, 395; Kom. Fl. Manch'zh. III, 1, 246; Kom. and Alis., Opred. rast. Dal'nevost. kr. II, 854.— **F. nigra** var. **mandschurica** (Rupr.) Lingelsh. in Engl. Pflanzenr. IV,



Plate XXV

1. *Fraxinus excelsior* L.—2. *F. oxycarpa* Willd.—3. *F. angustifolia* Vahl.—4. *F. syriaca* Boiss.—5. *F. raibocarpa* Rgl.—6. *F. pojarkoviana* V. Vassil.—7. *F. coriariifolia* Scheele—8. *F. rhynchophylla* Hance.—9. *F. sogdiana* Bge.—10. *F. mandschurica* Rupr.

243, I, II (1920) 57. — *F. excelsissima* Koldz. in Acta phytotax. et geob. III (1934) 41. — Ic.: Kom. and Alis., l.c., Plate 260, Figs. 1-3; Nakai, Fl. sylv. Korean. X, tab. 8.

495 Tree, up to 30 m tall, the trunk up to 1 or rarely 2 m in diameter, the light gray bark with slender cracks; branchlets stoutish, the dark yellow bark verrucose-punctate; buds black, glabrous, rough; leaves imparipinnate, with 3-5 pairs of leaflets, the rachis dark red, paler toward the end; leaflets oblong-ovate, ovate-lanceolate, broadly lanceolate, or rarely lanceolate, 5-20 cm long, serrulate, long-mucronate, cuneate or rarely somewhat rounded at base, sessile or borne on very short petiolules, not anastomosing, the primary veins covered with long straight whitish or rufescent hairs, the base of leaflet with a tuft or sometimes a complete ring of tangled tomentum; young leaflets thin, becoming coriaceous in age, green above, pale green to glaucescent beneath; flowers polygamous; stigma 2-lobed; samara 28-35 mm long, up to 9 mm broad, narrowly obovate, truncate or round-tipped or slightly emarginate, the body half the total length. Fl. April; fr. September (Plate XXV, Figure 11).

Valleys of rivers and streams, within the flood zone. Occasionally cultivated. — Far East: Ze.-Bu., Uda, Uss., Sakh. **Gen. distr.:** Manchuria, Korea, N. China, Japan (Honshu, Hokkaido). Described from Amur. Type in Leningrad.

Note. A form of ash growing wild in S. Sakhalin was identified by Sugawara (Fl. of Saghal. IV (1940) 1537) as *F. mandschurica* Rupr. A group of ashes 30 to 50 years old which I saw in Sakhalin in 1951 had a completely smooth nonsplitting bark resembling aspen bark. This is definitely not characteristic of true *F. mandschurica* Rupr. in which the bark undergoes considerable splitting at a very early age (5 to 10 years). Apparently these trees represent a distinct form. However, in the absence of sufficient material, it is not possible to determine its precise taxonomic position.

Economic importance. The wood of this species is used for plywood, carpentry products, and various machine parts, where durable attractive light wood is required.

5. *F. excelsior* L. Sp. pl. (1753) 1057; Ldb. Fl. Ross. III, 36; Boiss. Fl. or. IV, 39; Wenzig in Engl. Bot. Jahrb. IV, 176; Dippel, Laubholz k. I, 82; Kuzn. in Mat. Fl. Kavk. IV, 245; Maevsk. Fl. ed. 7, 575. — Ic.: Regel', Dendrol. 209, f. 50; Rchb. Ic. Fl. Germ. XVII, tab. 31; Koehne, Dendrol. 510, f. 90.

496 Tree, up to 30 m tall; buds black, brownish-black or brown, sparsely covered with short brown hairs; young branchlets smooth, light gray with a greenish hue; leaves large, simple (car. monophylla Dipp.) or often imparipinnate, with 4-6 pairs of leaflets; leaflets borne on short winged petiolules or subsessile, thin, 4-11 (12) cm long, 1.5-4 (5) cm broad, oblong, narrowly elliptic or elongate-obovate, serrate, long-pointed, the upper surface glabrous, the lower surface with sparse crisp hairs on the midrib and sometimes on the lateral veins; racemes in clusters from the axils of preceding year's leaves, the fruiting rachis 4-13 cm long; staminate inflorescences short; flowers polygamous or more often bisexual, without corolla and without calyx; stigma biparted; samara narrow, linear, oblong elliptic to narrowly lanceolate, acuminate or obtusish, sometimes

emarginate, (2.7) 3.3-4.5 cm long, 0.7-1 cm broad, the body half to more than half the total length. Fl. May; fr. August (Plate XXV, Figure 1).

Mixed and broad-leaved woods.—European part: Lad.-Ilm., Balt., U. V., V.-Dnp., M. Dnp., U. Dns., V.-Don, Bes., Bl., Crim., L. Don; Caucasus: Cisc., W., S., and E. Transc. **Gen. distr.:** Scand., Centr. and Atl. Eur., Med., Bal.-As. Min. Described from W. Europe. Type in London.

Note. In the southern part of its distribution area, this species comes close to *F. oxycarpa* Willd. as regards fruit size and the number and breadth of leaflets, but differs clearly in the presence of several subequal flowering (or fruiting) racemes in the leaf axils. However, in some herbarium specimens of *F. oxycarpa* from the Crimea, the paniculate inflorescences have branches arising at the very base of the rachis, thus creating the impression of several racemes.

Economic importance. According to I. Klinge, the leaves and seeds of ash have medicinal value: the bark is used as quinine substitute and acts as a powerful anthelmintic; the seeds are put to similar use and are also employed against kidney pains; the leaves are used as a mild laxative and a very effective diuretic. The bark yields tanning material and a black dye. The leaves also serve as fodder. Ash wood, upon combustion, yields a large amount of potassium; it is much valued for its durability, ease of working and beautiful texture, and is therefore in considerable demand for carpentry, plywood production, and machine industry. Grown as an ornamental tree in gardens and parks.

Series 4. **Coriariifoliae** V. Vassil.—Racemes several in axils of preceding year's leaves; leaves covered beneath with curved forked hairs.

6. ***F. coriariifolia*** Scheele in Linnaea, XVII (1843) 350; Ldb. Fl. Ross. III, 37; Kuzn. in Mat. Fl. Kavk. IV, 249; Lingelsh. in Engl. Pflanzenr. IV, 243, I and II, 52.—*F. excelsior* var. *coriariaefolia* Boiss. Fl. or. IV (1879) 40; Dippel, Labholz. I, 83; Wesmael in Bull. Soc. Bot. Belg. 31 (1892) 90.—Ic.: C.K. Schn. Laubholz. II, f. 521, 1, f. 524, a.

497 Tree; branchlets light gray, cinereous; buds black, pubescent; leaflets (3) 4-6 pairs, sessile or borne on very short petiolules, 4-9 cm long, 1-3 cm broad, oblong-elliptic to broadly lanceolate, rounded or rarely subcuneate at base, terminating in a long point, finely denticulate, the upper surface glabrous or with scattered stiff hairs, the lower surface densely covered, especially on the veins, with rufescent curved forked hairs; calyx densely pubescent throughout; racemes several in the axils of preceding year's leaves, the rachis 3-5 cm long; samara oblong-lanceolate, enlarged at top, obtusish or slightly emarginate, up to 3.5 cm long, 0.7-0.9 cm broad, the body half the entire length. Fl. April; fr. August (Plate XXV, Figure 8).

Mountain woods.—European part: Crimea (vicinity of Feodosiya); Caucasus: E. Trans., Tal. Described from Talysh. Type in Berlin.

Note. As regards the number of leaflets, the overall leaf size, and the presence of several fruiting racemes in the leaf axils, this species resembles *P. excelsior*, but differs clearly in the profusely pubescent and only slightly denticulate leaves.

7. *F. Pallisae* Willm. ex M. Pallis in Journ. Linn. Soc. XVIII (1916) 284.— *F. holotricha* Prodan, Fl. Român. II (1939) 144.— Ic.: Prodan, l.c. tab. XXXIX (sub. *F. holotricha* Koehne).

Tree, up to 30 m tall; branchlets of the current year brown, densely lanate; preceding year's branchlets cinereous, mostly glabrous; buds small, brown or dark brown, rarely covered with isolated hairs; leaf rachis canaliculate above, the groove pubescent all the way down; leaflets 5-9 (11), lanceolate, the terminal tapering to a short petiolule, the lateral ones rounded at base, sessile or nearly so, all narrowed and pointed or more or less elliptic, serrate or rarely nearly entire, pubescent on both sides but especially beneath, densely pubescent on the midrib at base; inflorescence branches pilulose or nearly smooth; samara (30) 37-45 (70) mm long, 6-10 (12) mm broad, narrowly elliptic to elliptic-lanceolate, acute, with long-persistent style, sparsely hairy at base.

Danube floodplains.— European part: Bes. **Gen. distr.:** Balkans (Danube floodplains, Bulgaria, Turkish Thrace [European Turkey]). Described from Danube floodplains. Type in London.

Note. *F. holotricha* Koehne (in Mitteil. Deutsch. Dendr. Ges. 15 (1906) 67) differs clearly from *F. Pallisae* Willm. by the petioluled point-based leaflets. *F. holotricha* was described from garden specimens of unknown origin. Its fruits are also unknown. Prodan (Fl. 498 Român. 2 (1939), tab. XXXIX) presents an illustration of one species of ash based on specimens from the Danube floodplains, under the name *F. holotricha* Koehne. This seems to the authors to be erroneous, as the leaflets of the plant represented in the illustration are sessile, while those of *F. holotricha* are petiolulate. Koehne himself (l.c.) drew a comparison between his species and *F. coriariifolia* Scheele which it resembles in vestiture, as well as *F. potamophila* Rgl. which also has distinctly petiolulate leaflets. It is therefore clear that *F. Pallisae* is not identical with *F. holotricha*. *F. Pallisae* may thus be recognized as a distinct species.

Series 5. **Syriacae** V. Vassil.— Inflorescences long, racemose, slightly drooping, borne singly or with 2 or 3 small branches at base, in the axils of preceding year's leaves; leaflets sessile or nearly so.

8. *F. syriaca* Boiss. Diagn. ser. I, 11 (1849) 77; Lingelsh. in Engl. Bot. Jahrb. XL, 222; Engl. Pflanzenr. IV, 243, I, II, 53.— *F. sogdiana* Dippel, Laubholzk. I (1889) 92, non Bge.; Fedch. Rast. Turkest. 644; Lingelsh. in Engl. Pflanzenr. IV, 243, I, II, 52; Fedch. and Nekras. in Tr. po prikl. bot. ser. X, 2, 40.— *F. oxycarpa* var. *sogdiana* Wenzig in Engl. Bot. Jahrb. IV (1883) 176; Kuzn. in Mat. Fl. Kavk. IV, 244.— *F. turkestanica* Carr. in Rev. Hort. (1887) 63.— Ic.: Dippel, l.c. 92, f. 49; C.K. Schn. Laubholzk. II, 832, f. 524, e.

A large tree, the stout cylindric brownish-gray branchlets with profuse small light-colored lenticels; buds brown, dark brown or black, puberulous, axillary, obtusish; leaves on fertile branchlets in whorls of 3, on sterile branchlets opposite; leaflets 1-2-3 pairs, broadly lanceolate to narrowly elliptic or oblong-ovate, sessile or borne on very short winged petiolules, irregularly serrate or rarely erose-dentate, long-acuminate, glabrous, 3-6 cm long, 2-2.5 cm broad, cuneate at base; racemes numerous, borne

singly in the axils of preceding year's axils, the rachis up to 12 cm long; flowers destitute of calyx and corolla, mostly bisexual, borne 2 or 3 per verticillaster; styles long, with 2-lobed stigma; stamens 2, with short filaments, greatly exceeded by pistil; samara elliptic or elongate-elliptic, 2-4 cm long, 0.7-1.4 cm broad, obtusish, sometimes emarginate, with persistent style, the body half the total length. Fl. March.—April; fr. June (Plate XXV, Figures, 4, 7).

Flooded woods and mountain slopes.—Soviet Centr. Asia: Mtn. Turkm., Pam.-Al. ?, T. Sh. ? **Gen. distr.:** Bal.-As. Min., Arm.-Kurd., Iran. Described from Syria. Type in Geneva.

Note. Up till now, this species has been known under the wrong name *F. sogdiana* Bge. According to the author's original description, this name refers to herbarium specimens known under the name *F. potamophila* Herd. Comparison of the descriptions of *F. sogdiana* Bge. and *F. potamophila* Herd. indicates that they refer to the same Soviet Central Asian species, with long-petioluled leaflets, while the form conceived as *F. sogdiana* (non Bge.) has sessile leaves. Comparison of Soviet Central Asian specimens with samples of *F. syrica* proved their identity. Thus this species, commonly regarded as *F. sogdiana* auct. is none other than *F. syriaca* Boiss.

The occurrence of wild-growing Syrian ash in the mountains of Tien Shan and Pamir-Alai needs confirmation.

Economic importance. Grown in many places in Soviet Central Asia and E. Transcaucasia.

9. ***F. oxycarpa*** Willd. Sp. pl. IV, 2 (1805) 1100; Wenzig in Engl. Bot. Jahrb. IV, 174; Dippel, Laubholzk. I, 88; Lingelsh. in Engl. Bot. Jahrb. XL, 222; Kuzn. in Mat. Fl. Kavk. IV, 239.—*F. excelsior* subsp. *F. oxycarpa* Wesmael in Bull. Soc. Bot. Belg. 31 (1892) 94.—*F. oxyphylla* M.B. Fl. taur.-cauc. II (1808) 450.—*F. taurica* hort. sec. Koch, Dendr. (1872) 275.—Ic.: Dippel, l.c.f. 47.

Tree or tall shrub; branches green, cinereous or rufescent; leaves hysteranthous; leaflets (3) 5-7 (9), coriaceous or membraceous, oblong to oblong-lanceolate, sessile, 4-8 cm long, 1.5-2.5 cm broad, rounded or rarely subcuneate base, attenuate toward apex, acuminate, serrate, green above, pale green beneath, glabrous on both sides or pubescent on the veins beneath in lower part of leaflet; flowers polygamous, destitute of calyx and corolla, borne in clusters in axils of preceding year's leaves, forming a single large panicle or raceme and several short racemes or else a single fairly large panicle; rachis of panicle 3.5-8 cm long; inflorescences terminally crowded; stamens with short filaments, erect, appressed to style base; style with capitate faintly 2-lobed stigma, greatly exceeding the stamens; samara 2.8-4.5 cm long, 0.7-0.9 cm broad, oblong-elliptic or lanceolate to broad-lanceolate, mostly acuminate, narrowed at base, the midrib distinct right up to apex, the body more than half the total length. Fl. second part of April mid-May; fr. August-September (Plate XXV, Figure 2).

Woods.—European part: Crimea (S. coast); reports concerning the presence of this species in the Odessa and Rostov regions are rather dubious; Caucasus: W., E., and S. Transc., Tal. **Gen. distr.:** Med., Bal.-As. Min., Arm.-Kurd., Iran. Described from the Caucasus. Type in Berlin.

Note. A very polymorphous species. Resembling *F. syriaca* Boiss. in leaf shape and overall shape of fruit, but its fruits are much smaller and more or less pointed. There is an apparent resemblance to *F. angustifolia* Vahl, but here *F. oxycarpa* is clearly distinguishable by the more compound, mostly paniculate inflorescence or several smaller simplified panicles, as against the invariably racemose inflorescence of *F. angustifolia*. Another characteristic of *F. angustifolia* that distinguishes this species from *F. oxycarpa* consists in the remoteness of the pairs of narrow leaflets. *F. oxycarpa* also resembles closely *F. excelsior* L. in the short inflorescences, but differs from it in the smaller leaves, the narrow and rigid leaflets, as well as the relatively simpler structure of the inflorescence, this consisting mostly of a single panicle or more rarely of a panicle and 2 or 3 small racemes arising from the same leaf axil. Moreover, the stigma is almost entire, while in the case of *F. excelsior* the stigma is strongly 2-lobed and the fruit is relatively broad and short.

Series 6. **Angustifoliae** V. Vassil.—Inflorescences always racemose; leaflets sessile or subsessile; leaflet pairs remote.

10. ***F. angustifolia*** Vahl, Enum. pl. (1804) 52; DC. Prodr. VIII, 276; Wenzig in Engl. Bot. Jahrb. IV, 178; Dippel, Laubholz. I, 90.—*F. oxyphylla* M.B. Fl. taur.-cauc. II (1808) 450; Ldb. Fl. Ross. III, 37; Boiss. Fl. or. IV, 40, ex p.—*F. oxycarpa* var. *oxyphylla* (M.B.) Lingelsh. in Engl. Pflanzenr. IV, 343, I, II (1920) 54.—*F. oxyphylla* var. *oligophylla* Boiss. Fl. or. IV (1879) 40, ex p.—*F. oxycarpa* var. *oligophylla* Wenzig in Engl. Bot. Jahrb. IV (1883) 175.—*F. excelsior* subsp. *angustifolia* (Vahl) Wesmaelin Bull. Soc. Bot. Belg. 31 (1892) 99.—*F. oxycarpa* var. *angustifolia* (Vahl) Lingelsh. l.c. 55.—*F. oxycarpa* var. *australis* (Gay) Lingelsh. l.c. 55.—*F. rostrata* Guss. Pl. rar. (1826) 374.—*F. oxycarpa* var. *rostrata* (Guss.) C. Koch, Dendrol. II (1872) 245; Dippel, l.c. 88; Lingelsh. l.c. 55.—*l.c.*: Dippel, l.c. f. 48.

A small tree or tall shrub; branchlets green, lustrous, glabrate; buds black; leaves on sterile shoots opposite, on fertile shoots sometimes in whorls of 3, with remote leaflet pairs; leaflets 3-7, subcoriaceous or coriaceous, glabrous, narrowly elliptic, lanceolate, linear-lanceolate, or linear, green or dark green, sharply and deeply serrate or denticulate, narrowed at both ends, long-cuspidate, 3-14 cm long, 0.6-2.5 (3) cm broad, except the terminal subsessile; inflorescences borne singly in axils of preceding year's leaves, the rachis 3-4-6 (10) cm long; samara 2.5-3.3 cm long, up to 0.6-0.8 cm broad, narrowly lanceolate, acuminate or rarely somewhat obtusish, cuneately narrowed at base, the narrowly elliptic body more than half the total length. Fl. May; fr. August (Plate XXV, Figure 3).

501 Woods.—European part: Crim.; Caucasus: W. and S. Transc.
Gen. distr.: Atl. Eur., Med., Bal.-As. Min., Arm.-Kurd., Iran.
Described from Spain. Type in Denmark.

Note. This species is readily distinguishable from *F. oxycarpa* Willd. — with which it shares the narrow, glabrous, remote leaflets — by the broader fruits and longer, always racemose inflorescences. Transitional forms between the two species occur, and these are possibly

of hybrid origin. A comparison of the two species brings out the fact that *F. angustifolia* produces decidedly more xerophytic forms.

Most specimens from the Crimea and the Caucasus have broad acuminate samaras and this characteristic would seem to distinguish them from specimens derived from the western part of the Mediterranean region. The very limited number of herbarium specimens does not provide sufficient ground for setting up the Crimeo-Caucasian form as a distinct species.

11. ***F. Pojarkoviana*** V. Vassil. sp. n. in Addenda XVII, 750.

Tree, to upward of 20 m tall; branchlets grayish-brown; buds dark brown; leaves on sterile shoots opposite, on fertile shoots sometimes in whorls of 3; leaflets 9-11 very remote pairs, subcoriaceous, glabrous, narrowly elliptic, lanceolate or linear-lanceolate, green or dark green sometimes red above (and then the leaf rachis and the midribs of leaflets reddish-violet), sharply dentate, narrowed at both ends, long-cuspidate, 3-10 cm long, 0.8-2 cm broad, except the odd terminal almost sessile; inflorescences borne as single racemes in the axils of preceding year's leaves, the rachis 3-4-6 cm long; samara 3.5-5 cm long, enlarged toward top, slightly emarginate, cuneately narrowed at base, the body half the total length; flowers unknown. Fr. September (Plate XXV, Figure 6).

Woods in valleys and foothills. — European part: U. Dns. **Gen. distr.:** Bal.-As. Min. (Bulgaria). — Described from Transcarpathian Region. Type in Leningrad.

Note. A new species, related to *F. angustifolia* Vahl, described from Spain; differs from that species in the longer, distinctly emarginate samara of which the body does not exceed half the total length.

Economic importance. Widely used for afforestation in Transcarpathian Region.

502 Series 6. ***Petiolatae*** V. Vassil. — Leaflets petiolulate; fruiting racemes short, borne singly in the axils of preceding year's leaves; leaflets stomatiferous on upper surface.

Beside *F. sogdiana*, this series contains *F. parvifolia* Lam. (Iran, Asia Minor, Atl. Eur., Ned.) and *F. holotricha* Koehne (cultivated) of unknown origin.

12. ***F. sogdiana*** Bge. in Mem. sav. etr. Acad. Petersb. VII (1854) 390; C.K. Schn. Laubholz. II, 835. — *F. potamophila* Herd. in Bull. Soc. Nat. Mosc. XLI (1868) 65; Wesmael in Bull. Soc. Bot. Belg. 31, 103; Dippel, Laubholz. I, 98; Fedch. Rast. Turk. 644; Lingelsh. in Engl. Pflanzenr. 72, IV (1920) 52. — *F. Regelii* Dippel, Laubholz. I (1889) 97. — Ic.: Dippel, l.c.f. 53, 1; C.K. Schn. l.c. tab. 523 c, tab. 524 d.

Tree, ca. 10 m tall; branches brown or reddish-brown, rather slender; buds dark brown, puberulous; leaves on fertile branchlets in whorls of 3, on sterile ones opposite; leaflets 3-5 (rarely 6) pairs, orbicular to ovate or lanceolate to narrowly lanceolate, irregularly dentate or erose-dentate, mostly elongate-acuminate 2-5 cm long, 1-4 cm broad, the blade decurrent down the petiolule, this 4-10 mm long or longer; leaf rachis flattened above, slightly winged; inflorescence lateral, the short leaflets racemes borne in the axils of preceding year's leaves; flowers in whorls of 2 or 3, destitute of calyx and corolla; stamens 2; samara narrow, lanceolate,

round-tipped or acuminate, 3-5 cm long and 0.5-0.8 cm broad, with persistent style, the body less than half to half the total length. Fl. June; fr. August (Plate XXV, Figure 10).

Flooded woods and valley slopes. — Soviet Central Asia: Balkh., Dzu.-Tarb., T. Sh. Described from Ili R. and Karatau. Type in Moscow.

Note. *F. Regelii* Dipp., described by Dippel (l.c.), is not a distinct species, but merely refers to young shoots of *F. sogdiana* Bge.

Economic importance. Grown in the oases of Kyzyl-Kum and Kara-Kum, and also along Syr Darya and Amu Darya rivers.

Genus 1145. **SYRINGA*** L.

L. Sp. pl. (1753) 9. — Lilac Adans. Fam. pl. (1763) 223. — Liliacum Renault, Fl. Dép. Orne (1800) 100.

- 503 Inflorescence paniculate, terminal or axillary; flowers appearing with leaves, rose or white or lilac, aromatic; calyx short, tubular, 4-toothed, persistent; corolla infundibular, the tube greatly exceeding the calyx, enlarged upward, lobes 4; stamens 2, included in corolla tube; ovary bilocular, with 2 ovules in each locule; style filiform, included in corolla tube; stigma 2-lobed; capsule coriaceous, oblong, slightly flattened, 2-celled, with 2 flattened narrowly hyaline-winged seeds in each cell. Tree or shrub; buds brown; leaves entire, rarely lobed, very rarely pinnatifid, petiolate or rarely sessile, oval or lanceolate, more or less acuminate.

The genus contains 28 species, distributed through Asia and Europe. The greatest number of species occurs in E. Asia (Japan, Korea, and particularly central and SE China). Four species are represented in the flora of the USSR. All the species are grown in gardens and parks for their high ornamental value.

1. Inflorescence from terminal buds, borne at the end of current year's leafy shoot (section *Villosae* C.K. Schn.) 2.
- + Inflorescence from lateral bud or buds, borne at the end of current year's leafless axillary shoot (section *Vulgares* C.K. Schn.) 4.
2. Calyx and pedicel profusely covered with white spreading hairs; leaves hairy beneath over the whole surface or merely on the veins; inflorescence branches with velutinous surface of short rufescent hairs. 2. *S. robusta* Nakai.
- + Calyx greenish; calyx and pedicel glabrous or puberulous. 3.
3. Calyx glabrous or sparsely covered with short subappressed hairs, the segments broadly triangular; leaves covered beneath on the nerves, and sometimes over the whole surface, with subappressed hairs. **S. villosa* Vahl.
- + Calyx minutely silky-puberulous, the segments very short or wanting; leaves glabrous beneath; inflorescence branches covered with short silky hairs 1. *S. Josikaea* Jacq. f.
4. Branchlets stout, not arching; leaves broadly oval, rounded or mostly slightly cordate at base, glabrous. 3. *S. vulgaris* L.
- + Branchlets slender, often arching; leaves broadly lanceolate, lanceolate or narrowly oval. 5.
5. Leaves oblong-ovate, firm; inflorescence loose, large. **S. chinensis* Willd.

* From *scrinx*. Abyssinian name for this plant, or from the name of the nymph *Syrinx* who had changed into the bush from which Pan made his first pipes.

504 + Leaves lanceolate to broadly lanceolate, often pinnatifid, soft; inflorescences small, axillary, often numerous 3. *S. persica* L.

Section 1. **VILLOSAE** C.K. Schn. in Fedde, Repert. IX (1910) 80 et in Laubholzk. II (1912) 778. — Inflorescences from terminal buds, borne at the end of current year's leafy shoot.

**S. villosa* Vahl, Enum. pl. I (1805) 38; DC. Prodr. VIII, 283; Kom. Fl. Man'chzh. III, 1, 253, ex p.; C.K. Schn. Laubholzk. II, 780. — *S. Bretschneideri* Lemoine ex Wittmak in Gartenfl. XXVI (1895) 499. — Ic.: C.K. Schn. l.c.f. 490 e-h.

Shrub, to 4 m tall, densely leafy, with upright branches; young branchlets yellowish-gray; year-old branchlets often temporarily covered with very delicate short pubescence; 2-year-old branchlets grayish- to brownish-yellow, glabrous; lenticels conspicuous, light-brown, elongated lengthwise; leaf petioles 1-1.5 (2) cm long; blades oblong, narrowed at both ends, 4-16 cm long, 3.5-6 cm broad, the upper surface glabrous and green, the lower surface covered with widely scattered subappressed white hairs or glabrate, pale green; inflorescences (10) 15-30 cm long, erect, paniculate, borne at the ends of current year's shoots, the rachis glabrous or velutinous-pubescent, the branches velutinous or sparsely covered with long bristlelike hairs; calyx a quarter to one third the length of corolla, glabrous, greenish, often ciliate-margined, the segments broad, obtuse or nearly absent; flowers rose-violet, fragrant; corolla tube narrow, infundibular, together with limb to 14 mm long; corolla lobes spoon-shaped at the tips; capsule obtusish or slightly pointed, to 14 mm long. Fl. second half of June, July; fr. second half of July-August (Plate XXVI, Figure 3).

Mixed mountain woods, often on stony taluses near springs and in mountain stream valleys. — **Gen. distr.:** Manchuria, Korea, N. China (Chihli [Hopeh] Province). — Described from the vicinity of Peking. Type in Denmark.

Economic importance. In the USSR only cultivated. Being a valuable ornamental shrub, it is widely grown in gardens and parks in the European part of the Soviet Union, reaching north to Leningrad, and in Western Europe.

1. *S. Josikaea* Jacq. f. in Bot. Zeit. (1831) 57, 399; Borb. in Bot. Jahresb. X, 2, 117; Simonkai, Enum. Pl. transsylv. 392; Dippel, Laubholzk. I, 115; C.K. Schn. Laubholzk. II, 782; Lingelsh. in Engl. Pflanzenr. IV, 243, I and II, 78. — *S. vincetoxicifolia* Baumg. ex Steud. Nomencl. Bot. ed. 2, II (1841) 656. — *S. prunifolia* Kit. in Sched. 505 ex Borb. l.c. — Ic.: Rchb. Pl. crit. VIII, f. 1049; Rchb. Ic. bot. XVII, f. 1073; Lauche, Deutsch. Dendrol. 171, f. 58; C.K. Schn. l.c.f. 490, 1-n; Lingelsh. l.c. f. 2 (79), f. 3 (82).

Shrub, to 4 m tall; young branchlets dark green or brown, covered with fine short hairs, terete, lustrous, 1-year-old reddish-gray, 2-year-old gray, the lenticels scattered oblong; leaves elliptic to oblong-elliptic or broadly elliptic, rarely elongate-ovate, usually gradually pointed, papery, dark green and glabrous above, ciliolate-margined, pale cinerous and glabrous beneath, entire, the petioles 1-1.5 cm long; panicle elongated,

interrupted, many-flowered, at the end of leafy branchlet of current year's growth arising from terminal bud, the panicle branches very delicately puberulous; flowers rather crowded, reddish-azure, fragrant; calyx campanulate, covered with short silky hairs, 2 mm long, the 4 minute acutish segments separated by sinuses or calyx subtruncate, rarely sinuately 4-lobed; corolla tube narrowly infundibular, slightly and gradually enlarged upward, 1-1.2 cm long, the lobes ovate, slightly pointed; anthers yellow; capsule cylindric, glabrous, 1 cm long, 4 mm in diameter. Fl. June; fr. August (Plate XXVI, Figure 2).

Mixed mountain woods.—European part: U. Dns. (E. Carpathians).

Gen. distr.: Centr. Eur. (Hungary). Described from Hungary. Type in Berlin.

Economic importance: Often grown in gardens and parks.

2. *S. robusta* Nakai, Fl. sylv. Kor. X (1921) 57; Kom. and Alis. Opređ. rast. Dal'nevost. kr. II, 859, ex p.—*S. villosa* Kom. Fl. Man'zhch. III (1905) 253, ex p.—*S. villosa* var. *hirsuta* C.K. Schn. in Fedde, Repert. IX (1910) 81 et in Laubholz. II (1912) 780; Lingelsh. in Engl. Pflanzenr. IV, 243, I, II, 80.—*lc.*: Kom. and Alis. l.c. Plate 261, Figures 2-3, 7.

Erect shrub, to 3-5 m tall; branches grayish-brown, the branchlets studded with minute oblong or oblong-linear rufescent lenticels; young branchlets sparsely covered with short rufous hairs or glabrate; leaves large, the petiole (1) 2 (3) cm long, hairy or smooth, the blade 6-17 cm long, 3-6 cm broad, elliptic or oval-oblong, acute or acuminate, cuneately narrowed at base, green above, the lower surface pale, with velutinous surface of curved spreading slightly colored or scattered appressed white hairs or merely long-hairy on the veins or rarely glabrous; panicle erect, borne at the end of current year's shoot, leafy, interrupted, densely
506 flowered, the rachis and branches velutinous with a dense coat of short rufescent hairs; calyx cupuliform, 2-2.5 mm long, hairy, obscurely 4-toothed or truncate, brown; corolla purple, to 14 mm long, the tube 8-11 mm long, smooth, the lobes reflexed, the claws curved at a right angle; style 4-5 mm long; fruit 10-12 mm long, smooth, mostly obtusish at the top. Fl. second half of June-July; fr. July-September (Plate XXVI, Figure 1).

Mixed and fir-and-spruce mountain woods, in mountain stream valleys and on mountain tops near the timberline.—Far East: Uss. (Murav'ev-Amurskii Peninsula, Pos'et). **Gen. distr.:** N. Korea, N. Manchuria. Described from Korea. Type in Tokyo.

Section 2. **VULGARES** C.K. Schn. in Fedde, Repert. IX (1910) 79 et in Laubholz. II (1912) 772.—Inflorescences leafless, from upper lateral buds, rarely also from terminal bud.

3. *S. Vulgaris* L. Sp. pl. (1753) 11; Ldb. Fl. Ross. III, 38; Dippel, Laubholz. I, 112; Velenovsky, Fl. Bulg. 378; C.K. Schn. Laubholz. II, 774; Lingelsh. in Engl. Pflanzenr. IV, 243, I and II, 88.—*S. latifolia* Salisb. Prodr. Stirp. (1796) 13.—*S. cordifolia* Stokes, Bot. Comm. I (1830) 43.—*Lilac vulgaris* Lam. Fl. franc. II (1778) 305.—*lc.*: C.K. Schn. l.c.f. 485, a-c; f. 486, i-m.

Tree or shrub, 2-5 (10) m tall; young branchlets distinctly glandular-pubescent; 1-year-old branchlets yellowish or grayish-yellow; leaves oval, subcordate or tapering at base, acuminate, 5-10 cm long, 2-6 cm broad,



Plate XXVI

1. *Syringa robusta* Nakai.—2. *S. Josikaea* Jacq. f.—3. *S. villosa* Vahl.—4. *Ligustrina amurensis* Rupr.—5. *Ligustrum yezoense* Nakai.—6. *L. Tschonoski* Dcne.—7. *L. acuminatum* Koehne.

subcoriaceous, smooth, the petiole to 2 cm long; inflorescence mostly from uppermost lateral buds, rarely also from terminal bud; calyx 2 mm long, 4-toothed, with broad arcuate sinuses between the teeth, glandular-ciliolate on the margin, farinose throughout; corolla tube narrowly cylindric, ca. 1 cm long; corolla lobes 4 (5), oval, more or less rounded at apex; flowers lilac, white, azure, or red; fruit smooth, lustrous, brown, 1-1.5 cm long, 0.5 cm in diameter, slightly compressed, pointed.

European part: U. Dns. (Carpathians, mixed scrub, at altitudes up to 1200 m), Crimea (according to O. A. and B. A. Fedchenko, in Lasp R. valley; possibly escaped from cultivation?). **Gen. distr.:** Centr. Eur. 509 (Hungary), Bal.-As. Min. (mountains of the Balkan Peninsula). Described from Europe. Type in London.

Economic importance. An ornamental shrub, often grown in gardens and parks.

4. **S. persica** L. Sp. pl. (1753) 9; Boiss. Fl. or. IV, 38; Dippel, Laubholzk. I, 114; C. K. Schn. Laubholzk. II, 775; Lingelsh. in Engl. Pflanzenr. IV, 243, I, II, 90; Grossg. Fl. Kavk. III, 222.—*S. laciniata* Mill. Gard. Dict. ed. 8 (1768).—*S. angustifolia* Salisb. Prodr. Stirp. (1796) 14.—*Lilac persica* Lam. Encycl. meth. III (1789) 513.—*L. minor* Moench, Meth. pl. (1794) 431.—*l.c.*: Bot. Mag. XIV, tab. 486; C. K. Schn. l.c. 772, f. 485, k-s, et f. 486, n-q.

Shrub, 1-2 m tall, with strongly spreading branches; young branchlets very slightly glandular-pubescent or glabrous; branchlets gray or brown, lenticellate, more or less arching, slender; leaves chartaceous or coriaceous (var. *coriacea* Lingelsh.), glabrous, entire or on the same plant both entire and pinnatifid (f. *laciniata* Vahl.), 2-4 cm long; leaflets not divided, lanceolate to broadly lanceolate or narrowly oval, to 1 cm broad, narrowed toward base, distinctly tapering toward apex, acute; inflorescences many-flowered, from uppermost lateral buds and mostly also from the terminal bud; lateral inflorescences shorter than the branches; flowers whitish-lilac or white; calyx ca. 2 mm long, more or less distinctly 4-toothed, mostly rather deeply splitting in fruit into two parts; calyx segments broadly triangular; corolla tube cylindric or slightly infundibular, ca. 1 cm long; corolla lobes broadly oval to oval-lanceolate, acutish; fruit 4-angled, very narrowly winged at the angles, to 1 cm long, 0.3 cm in diameter, dark rufous, obtusish or sometimes short-pointed. Fl. May-June; fr. July-August.

Caucasus: Tal. (Lenkoran, and also as escapee from cultivation in Dagestan). **Gen. distr.:** Iran., Ind.-Him. (Kashmir, NW Himalayas). Most probably described from garden specimens, originating from Iran? Type in London.

***S. chinensis** Willd. Berl. Baumzucht (1796) 378; Sp. pl. I, 48; Lingelsh. in Engl. Pflanzenr. IV, 243, I and II, 89.—*S. rothomagensis* Ach. Rich. ex DC. Prodr. VIII (1844) 282.—*S. corellata* A. Braun in Sitzber. Ges. naturf. Fr. Berlin (1873) 69.—*Lilac media* Dumont de Courset, Bot. cult. I (1802) 709.—*L. persica* Rothomagensis Wirb. in Duham. Trait. arb. Nouv. ed. II (1804) 208, non L.—*l.c.*: Wirb. in Duham. l.c. tab. 63; C. K. Schn. Laubholzk. II, 772, f. 485, n-v (folia).

A spreading shrub, 2-3 m tall; young branchlets nearly smooth; branches 510 mostly arched-pendulous, slender, brown or grayish-brown; leaves oval-lanceolate to oblong-lanceolate, 5-7 cm long, 3-4 cm broad, narrowed

toward base, gradually tapering toward apex, subcoriaceous, smooth, the petioles to 1.5 cm long; inflorescences large, loose; flowers lilac; calyx 2 mm long, mostly oblique, rather irregularly 4-parted, the segments acutish; corollatube cylindric, 0.7-1 cm long; corolla lobes 4, oval, obtusish or slightly pointed; fruit 4-angled, to 1 cm long. Fl. May-June; fr. July-August.

So far known only in cultivation. Most authors regard this species as a hybrid *S. persica* × *S. vulgaris*, but the marked stability of leaf and inflorescence shape seems to contradict this view. Occurring occasionally in gardens and parks in the southern part of the European USSR and in Western Europe. Described from cultivated specimens. Type in Berlin.

Genus 1146. **PHILLYREA** * L.

L. Sp. pl. (1753) 7.

Flowers white, in axillary bundles; calyx short, quadrilobate; corona almost wheel-shaped, quadripartite with broad blunt lobes leaning on each other; anthers almost sessile with loculi opening on the side but almost outside; style short, with thick-headed stigma; fruit black, succulent with a friable stone and with papery walls. Trees and shrubs with coriaceous evergreen leaves.

There are 6 *Phillyrea* species all concentrated in the Mediterranean region. A great number of forms and varieties were found. Their taxonomic value is not yet exactly determined. The species of the genus are very decorative thanks to their coriaceous shiny evergreen foliage.

1. Leaves not more than 5-6 cm long; branches glabrous or finely pubescent 2.
- + Leaves 12 cm long; branches always glabrous. 1. **Ph. Medwedewii** Sred.
2. 1- and 2-year old branchlets finely pubescent; leaves as a rule more or less elliptic. ***Ph. latifolia** L.
- + Branchlets always glabrous; leaves as a rule more or less lanceolate. ***Ph. angustifolia** L.

511 1. **Ph. Medwedewii** Sred. in Lesn. zhurn. 6 (1875) 107; Trautv. in Tr. Bot. Sada, IX, 529. — **Ph. Vilmoriniana** Boiss. et Bal. in Boiss. Fl. or. IV. (1876) 37; Dippel, Laubholz. I, 138; Kuzn. in Mat. Fl. Kavk. IV, 257. — **Ph. decora** Boiss. et Bal. in Vilmor. Fl. Pl. Terre, Suppl. (1867). — Ic.: Curtis Bot. Mag. LXI, tab. 6800; Dippel, l. c. 138, f. 86; C.K. Schn. Laubholz. II, 786, f. 493, a, b; 787, f. 494, g-m. — Exs.: Boiss. et Bal. 1866.

Shrub, 1-3 m tall, with glabrous, widely spreading branches; 1-year-old branchlets olivaceous, 2-year-old rather grayish; leaves glabrous, thick, coriaceous, ovate-lanceolate or oblong-obovate to lanceolate, narrowed or slightly rounded at base, acuminate and point-tipped, dark green and shining above, yellowish-green beneath, 5-16 cm long, 2.5-6 cm broad, entire or distantly dentate, revolute, the petiole 1-1.5 cm long; flowers white, borne on short pedicels in axillary clusters; calyx parted to the middle into acute triangular segments; corolla lobes oblong; fruit an ellipsoid-oblong obtusish dark purple drupe. Fl. June-July; fr. August.

Coppices along open forest margins, among undergrowth of wooded valleys and on slopes, at altitudes up to 1800 m. — Caucasus: W. and S. Transc. **Gen. distr.:** Arm.-Kurd. Described from Lazistan. Type in Paris.

Economic importance. Grown as ornamental along the Caucasian coast and in Crimea.

* A name mentioned by Dioscorides; derived from *philyra*, alluding to the lyrate leaves.

***Ph. latifolia** L. Sp. pl. (1753) 8; Dippel, Laubholzk. I, 136; C.K. Schn. Laubholzk. II, 787.— Ic.: C.K. Schn. l.c. 786, f. 493 l-s, f 494 b-f.

Shrub with upright branches or tree to 5 m tall; branches up to 2 years old, leaf petioles and inflorescence branches mostly finely pubescent; leaves very variable in shape (hence numerous varieties and even species have been described): oval to subcordate at base, tapering upward, serrate, oval-oblong, acute, sharply serrate (var. *ilicifolia* Willd., pro spec.), or lance-oblong, acute, serrate, oblique (var. *obliqua* Willd. pro sp.), or elliptic, the upper ones obscurely serrate, etc.; flowers as in the preceding species; fruit globose, shorter than broad. Fl. April-May, fr. August.

Dry soils, in coppices and in slightly shaded places. In the USSR only cultivated (Crimea). There are some old, so far unconfirmed reports (Ldb. Fl. Ross. III, 39) concerning the occurrence of this species in Imeretria. Habitat: Mediterranean region to E. Turkey inclusive. Described from the Mediterranean region. Type in London.

512 Note. There are transitions to *Ph. angustifolia*, but the two species are readily distinguishable, since the branchlets of *Ph. angustifolia* are always glabrous and those of *Ph. latifolia* pubescent.

***Ph. angustifolia** L. Sp. pl. (1753) 7; Dippel, Laubholzk. I, 137; C.K. Schn. Laubholzk. II, 786.— *Ph. lanceolata* Ait. Hort. Kew. I (1796) 11.— Ic.: Rchb. Ic. Fl. Germ. tab. 34, 35; C.K. Schn. l.c. 786, f. 493, c-k; 787, f. 494, a.

Shrub, 1-2 (rarely 3) m tall, with rather long glabrous light gray or light yellowish-gray branchlets; leaves short-petioled, thick, coriaceous, turned upward at a right angle, narrowly elliptic to narrowly lanceolate, gradually narrowed at both ends, 3-6 cm long, 5-12 mm broad, entire or finely and sharply serrulate, glabrous on both sides, dark green above, pale beneath; flowers short-pedicel, in axillary clusters; calyx broadly campanulate, the lobes triangular obtuse; corolla white, subrotate, the lobes obtusish; anthers large, exserted from corolla; fruit globose, subulately pointed, blackish-azure. Fl. March-June; fr. August-September.

Only cultivated in subtropical areas (Crimea). The report (Ldb. Fl. Ross. III, 39) concerning its occurrence at the Kuma River has not been confirmed by anyone. Habitat: W. Mediterranean. Described from the Mediterranean region. Type in London.

Note. A very polymorphous species as regards shape and size of leaves; resembling in this respect the preceding species.

Genus 1147. **OLEA** * L. **

L. Gen. pl. (1754) 8.

Flowers small, whitish, dioecious or bisexual, often fragrant; calyx persistent, cup-shaped, short, obscurely 4-toothed; corolla gamopetalous, the tube short, the lobes 4 (rarely 5), subovate, equaling the calyx, sometimes corolla wanting; stamens 2 (rarely 3), attached at the base of the short tube, with short filaments; anthers straight, dehiscent

* Latin name for olive tree.

** Prepared by A.G. Borisova.

subdorsally, in staminate flowers ventrally; ovary short, superior, subglobose, bilocular; stigma bilobed, short, obtusely capitate; fruit a drupe, commonly single-seeded, with a hard ovoid, oblong, or orbicular kernel and oily pulp; seeds with fleshy cotyledons, flat plumule, and short radicle. Trees or shrubs; buds sessile, scaleless; leaves opposite, simple, 513 oblong-ovate to lanceolate, entire or rarely crenate, coriaceous; inflorescence a raceme or flowers in axillary or rarely terminal clusters.

About 32 olive species are distributed through the tropical and central parts of Asia and the Mediterranean region, chiefly in India (7), Australia and Polynesia (7), Cape Province (8), tropical Africa, the islands of Macaronesia*, and New Zealand.

Only one species occurs in the USSR.

Section EUOLAEA DC. Prodr. VIII, 284.— Flowers with corolla; stamens attached at the base of corolla.

1. **O. europaea** L. Sp. pl. (1753) 8; Pall. Fl. ross. II, 18; DC. Prodr. VIII, 284; Ldb. Fl. Ross. III, 38; M.B. Fl. taur.-cauc. I, 5; Boiss. Fl. or IV. 36; Shmal'g. Fl. II, 205; Kuzn. in Mat. Fl. Kavk. IV, 1, 259; Med. Der. i kust. Kavk. 203; Grossg. Fl. Kavk. III, 222.—

O. europaea var. *sativa* DC. Prodr. VIII (1844) 284.— *O. sativa* Hoffm. et Link. Fl. Port. I (1809) 388.— *O. oleaster* Hoffm. et Link. l. c. 387.— Ic.: Fedch. and Fler. Fl. Evrop. Rossii, Figure 632; C.K. Schn. Laubholzk. II, 793; Monyushko, Maslina i masl. r-ny SSSR (Olive and Olive-Growing Regions of the USSR), Fig. 1, etc.; Varlikh, Russk. lek. rast., Fig. 73.— Exs.: Rchb. exs. No. 1189; Fl. exs. Austro-Hung. No. 2200.

Evergreen shrub 1-3 m tall or tree 4-5 and up to 10-12 m tall, with profusely silvering bark; wood greenish-yellow, with specific weight 0.8-1.1; canopy variable in shape; bark greenish-gray, smooth, splitting with age, early becoming knotty; branches curved, young long and slender, becoming gnarled with age, unarmed in cultivation, spiny when growing wild, opposite or in whorls of 3 or solitary, subterete or in naturalized plants nearly 4-angled, the branches and buds slightly white-lepidote; leaves decussate, commonly lanceolate or oblong to oblong-ovate or obovate, 5-8 cm long, 10-20 mm broad, apiculate, rarely obtuse or emarginate, entire, slightly revolute, strict, renewable every 2-3 years, coriaceous, the upper surface dark green and glabrous, sparsely covered with whitish-stellate-peltate scales, the lower surface silvery-gray, white-fluffy or ferruginous-brown with a dense coat of numerous scales, the petiole 2-5 mm long; inflorescences simple or nearly paniculate racemes, opposite in leaf axils, borne on nearly straight peduncles, slightly shorter than the leaves, drooping in fruit; flowers, small, fragrant, bisexual or diclinous, actinomorphic, short-pedicel, often deciduous and failing to set fruit; 514 calyx cup-shaped, hyaline, persistent, gamosepalous, minute, with 4 acute obsolescent teeth, often rupturing in fruit; corolla whitish, white or greenish, deciduous, gamopetalous, short-tubed, corolla lobes 4, rounded-ovate, spreading, obtuse, involute, 3-nerved, occasionally corolla wanting; stamens 2, shorter than corolla, attached on upper part of corolla tube, the filaments short; anthers ovaloid, 2-loculed, emarginate at summit,

* [Evergreen forest subregion, comprising small hilly islands in the Atlantic, western Canary Islands, Madeira and Azores.]

dehiscing with oblong lateral slits; ovary terete, bilocular, superior, each locule containing 2 pendulous ovules, of these only one developing into seed, rarely 2; style short, barely exerted from corolla tube; stigma emarginate, 2-lobed, the thickened ovate lobes slightly divergent; fruit a single-seeded drupe, (1) 2-3.5 cm long, oblong to globose, obtuse or pointed, fleshy, green, whitish, reddish or violet, sometimes almost black, unripe hard and green; mesocarp fleshy, green or whitish, 2-8 mm thick; kernel single-unilocular, commonly 1-seeded, rarely 2-seeded or 2-loculed, oblong, brown or with light-colored reticulation; seed oblong, brown, with a network of thick nerves. Fl. May-June; fr. September-December.

Cultivated in coastal areas of the Mediterranean region, sometimes penetrating inland. The olive is cultivated in the USSR mostly in the evergreen scrub zone, occasionally grown wild, mostly over limestone, on rocky slopes in the subtropical region, at altitudes from 100 to 500 m. — European part: Crimea (S. coast); Caucasus: W. Transc. (Black Sea coast), E. Transc. (Caspian coast and Apsheron Peninsula). **Gen. distr.:** Eastern Mediterranean is considered as the habitat of the olive; cultivated olive is widely distributed in the Mediterranean region, from Asia Minor and Syria to NW Africa and Portugal, in Mesopotamia, N. Iran, and Afghanistan, in N. and S. America (Argentina, Chile, Peru, California, Mexico), in Australia, and in Cape Province. The olive is a typical crop of dry subtropics.

Note. A form of olive grown wild is distinguished.

Spontaneous olive — *Olea oleaster* Hoffm. et Link (*Olea europaea* var. *silvestris* Rouy, *O. europaea* var. *oleaster* DC.).

Shrubs and small trees, 1-3 m tall; branchlets thorny, more or less 4-angled; leaves elliptic or obovate, to 4 cm long; fruits small, 10-12 mm long, globose.

Cultivated olive — *O. europaea* L. (*O. sativa* Hoffm. et Link, *O. europaea* var. *sativa* DC.).

- 515 A tree from 4-5 to 10-12 m tall, with subterete thornless branchlets; leaves lanceolate, 5-8 cm long, 1-2 cm broad; fruit globose to oblong, 2-3.5 cm long.

The wild or spontaneous form occurs in Crimea and in the vicinity of Gagra where, according to Yu. N. Voronov, it was introduced by birds. Special field observations are needed to clarify the question of the distinctness of identity of the two forms.

As the parent species of *O. europaea*, Chevalier (A. Chevalier, L'origine de l'Olivier cultivé et ses variations, 1948) proposes *O. chrysophylla* Lam., a species represented by numerous forms and widely distributed from the Himalayas to the Atlantic Ocean in the west and to Cape Province in southern Africa. In the Himalayas *O. chrysophylla* ascends to 1700 m above sea level, and it also grows in Kashmir, Punjab, Afghanistan, and Baluchistan.

The olive is characterized by its longevity; it usually lives 200-300 years; and occasionally attains the age of 2000 years and more. The rate of growth is extremely slow. The trunk attains a thickness of 4 m (in Cyprus); in Majorca an olive trunk is reported with a circumference at base of 13 m.

The olive is cultivated since remote antiquity. Seeds as well as olive presses, found in archeological excavations, indicate that about 3500 years ago the inhabitants of Greece were acquainted with olive and its exploitation.

The olive has been cultivated in the Crimea for a very long time. According to archeological data, it found its way here from Greece and Asia Minor long before our era.

At present, olive is widely cultivated in the Caucasus and the Crimea, and is also grown in western Turkmenistan.

Numerous varieties are distinguished according to the shape of fruit and kernel, oil content, etc. Varieties are available for oil production, and for preservation, as well as all-purpose varieties suitable for both.

Propagation material in the USSR consists of local varieties from the Crimea, Azerbaijan, etc., as well as foreign, Italian or Californian varieties.

The limited resistance of olive to drought and frost restricts its spread. Future selection work ought to be directed, on the one hand, toward development of highly drought-resistant and frost-hardy varieties, with a view to driving olive cultivation into more northerly and more arid regions (such as Soviet Central Asia), and on the other hand, toward obtaining more high-yielding and large-fruited varieties.

Economic importance. The olive tree is cultivated for its oil which is used in food and technology. Depending on quality and method of
516 preparation, numerous varieties of oil are distinguished. The inferior grades of olive oil are known as wood oil. Olive oil is also used for medicinal purposes: as a prophylactic remedy for atherosclerosis, applied both externally and internally, and also in veterinary practice. It is used in perfumery for the production of various kinds of soap. Oil cakes yield charcoal, vinegar and tar. The nondrying olive oil is particularly valuable for technological use. Beside yielding oil, known as Provençal oil (after the French province where olive is widely cultivated), the fruits are used for food — canned, salted, or pickled.

Olive wood is one of the heaviest and toughest woods (specific weight 0.8-1.1); it is used for furniture, inlays, and various minor joinery and carpentry products.

The average chemical composition of olive fruits is as follows: proteins 5.24 %, fats 51.9 %, nitrogen-free extractives and fibers 10.45 %, water 30.7 %, and ash 2.34 %.

The oil content of olive fruit pulp ranges from 20 to 75 %, depending on variety and growing conditions. The oil contains a considerable amount of carotin; the fruits contain 11.05 mg % vitamin C and 8 mg % vitamin E; the oil of peeled olives contains 20-50 γ vitamin D per 100 g (Grossgeim).

Genus 1148. **LIGUSTRINA** * RUPR.

Rupr. in Bull. Phys. math. Acad. Petersb. XV (1857) 371. — Gen. Syringae Sectio Ligustrina (Rupr.) Maxim. Prim. Fl. amur. (1859) 193.

Flowers in compound panicles, white, fragrant, appearing with leaves; calyx short-tubular, 4-toothed, persistent; corolla infundibular, short-tubed, 4-lobed; stamens 2, with long filaments, exserted from corolla tube; ovary 2-loculed, with 2 ovules in each locule; style filiform, with

* *Ligustrina* — resembling *Ligustrum*.

2-lobed stigma; capsule coriaceous, oblong, somewhat compressed, slightly curved, 2-loculed, with a central septum; seeds 1 or 2 in each locule, flattened, membranous-winged.

The genus *Ligustrina* is intermediate between the genus *Syringa* L., which it resembles in its fruits, and the genus *Ligustrum* L. with which it had in common the infundibular corolla and, with some of its species, the much exserted stamens.

517 A genus distributed through the Amur area, Maritime Territory, N. China, Korea, and Japan, and comprising altogether 4 species. Large beautiful ornamental shrubs or trees.

Note. Beside the species represented in the USSR flora, the genus contains: *L. pekinensis* Rupr. (in Bull. Phys. math. Acad. Petersb. XV (1857) 371), distributed in China (the provinces of Hansu, Shensi, and Chihli); *L. japonica* Maxim. (in Mel. biol. (1874) 395, pro var.), in Japan on Hokkaido and Honshu, and *L. Fauriei* (Levellé) V. Vassil. comb. n (*Syringa Fauriei* Léveillé in Fedde, Report. VIII [1909] 285), in the mountains of N. Korea. All the four species compose a genetical series of recent, closely related species, not conspicuously different from each other.

1. *L. amurensis* Rupr. in Bull. Phys. math. Acad. Petersb. XV (1857) 371 et in Beitr. Pflanzenk. Russ. Reich. 55; Rgl. in Gartenfl. 115.—*Syringa amurensis* Rupr. l.c. (1857) 371; Kom. Fl. Man'chzh. III, 1, 250; Lingelsh. in Engl. Pflanzenr. IV, 243, I and II, 92; Kom. and Alis. Oprod. rast. Dal'nevost. kr. II, 859.—*S. amurensis genuina* Maxim. in Mem. sav. etr. Petersb. IX, 1 (1859) 193; Sugawara, Ill. Fl. of Saghal. IV, 1539.—*Ligustrina amurensis* var. *mandschurica* Maxim. in Mel. Biol. IX (1874) 395.—Ic.: Curtis Bot. Mag. XVIII tab. 7534; Rgl. l.c. tab. 396, Nakai, Fl. sylv. Korean. X, 10; Kom. and Alis. Oprod. rast. Dal'nevost. kr. II, Plate 261, Figures 1, 4-6.

A large shrub or a tree up to 10 m tall, with a profusely leafy canopy; bark gray or dark brown with numerous white elliptic lenticels; leaves elliptic or oval, long-acuminate, scabrous with short hairs or smooth on the margin, firm, subtruncate or subcordate at base, uniformly colored, with a prominent network of veins beneath; panicles subterminal, to 25 cm long and 20 cm in diameter; pedicels very short; flowers white, fragrant; calyx irregularly toothed, smooth, the narrow acuminate teeth up to 1 mm long, the limb two-thirds as long as the exserted part of stamens, the obtuse lobes infundibularly spreading; fruit an oblong obtuse white-spotted 2-celled capsule, opening lengthwise with 2 valves, with persistent calyx, each cell containing 1 (2) flat winged seeds. Fl. June; fr. second half of July (Plate XXVI, Figure 4).

Mixed woods in valleys and shrub thickets on the banks of rivers, streams, and brooks. Gen. distr.: Manchuria, Korea. Described from the Amur area, according to Maak's collections. Type in Leningrad.

L. Sp. pl. (1753) 7.—Laulia Rafin. Fl. Tellur. II (1836) 84.—Ligustridium Spach, Hist. végét. VIII (1839) 971.—Visiania DC. Prodr. VIII (1844) 889.—Phlyarodoxa Moore in Trim. Journ. of Bot. XIII (1875) 229.—Esquirolia Lév. in Fedde, Repert. X (1912) 441.—Parasyringa W.W. Sm. Trans. Bot. Soc. Edinb. XXVII, 1 (1916) 93.

Inflorescence a panicle or a raceme, terminal; flowers white, bisexual; calyx campanulate, short, irregularly crenate, 4-toothed or 4-lobed; corolla more or less funnelform, the tube equaling to 3 times the length of the calyx, the recurved or incurved lobes one third as long to slightly longer than the tube; stamens 2, adnate to corolla tube, alternate with the lobes, the filaments as long as corolla lobes and anthers exerted or filaments shorter than corolla lobes and anthers almost included in the tube; anthers ellipsoid or oblong; style filiform, exerted or included in the corolla tube, the stigma scarcely lobed or simple; ovary globose, 2-loculed, each locule containing 2 pendulous ovules; fruit baccate with hyaline endocarp, drupaceous with papery endocarp, or loculicidal-drupaceous; seeds 1-4, mostly 1, with thin testa and fleshy albumen; cotyledons flat, oval, the radicle short superior. Shrubs or small trees, evergreen or deciduous; leaves simple, opposite, more or less elliptic, soft or coriaceous.

This genus contains about 28 species, of these only 4 growing wild in the USSR. Most species are distributed through SE Asia, and partly in Malaya, in the Sunda Islands and in Ceylon. The genus includes both evergreen and deciduous forms, and also intermediate forms in which leaf shedding is incomplete and does not always occur.

Economic importance. L. lucidum and L. Ibota S. et Z. yield Coccus Pela (nutlets). The leaves of L. Ibota are used as tea substitute, while the fruits of L. Ibota var. Regelianum (= L. Regelianum Koehne in Ascherson's Festschr. (1904) 193) are used as a substitute for coffee beans. L. vulgare serves as a "medicinal and dye-yielding plant". Ornamental plants.

Ligustrum vulgare L.f. fossile Palib, in Akchagyl layers of E. Transc. (Shvindgel' Ridge in S. Kakhetiya).

1. Endocarp hyaline, composed of thin-walled cells; seeds mostly 2-4. 3. L. vulgare L.
- 519 + Endocarp papery, composed of thick-walled cells; seeds 1 or 2. 2.
2. Leaves thick, coriaceous, more or less lustrous above, glabrous, evergreen. 3.
- + Leaves, mostly membranous, at least initially covered with hairs, deciduous. 4.
3. Leaves short-acuminate or more often obtuse, to 6 cm long, not more than twice as long as broad; corolla tube as long as or slightly longer than the lobes; stamens less than twice the length of corolla tube. *L. japonicum Thunb.
- + Leaves long-acuminate, somewhat more than twice as long as broad, on the average about 7 cm long; corolla tube shorter than the lobes; stamens twice the length of corolla tube. *L. lucidum Ait.
4. Young branchlets covered with crisp hairs; leaves 2-4 (5) cm long, 1.5-2 cm broad, obovate or elliptic, rarely orbicular, cuneate at base; fruit obovoid. 2. L. yezoense Nakai.

* A name mentioned by Virgil in the Bucolics. The name may also be derived from the word ligare = to tie, referring to the use of the thin and pliable branchlets in wickerwork.

- + Young branches covered with more or less straight hairs; leaves slightly shining, broadly lanceolate or ovate-oblong or narrowly elliptic; fruit globose, slightly lustrous 1. *L. Tschonoskii* Dcne.

Section 1. **SUBDRUPACEAE** Mansf. in Engl. Bot. Jahrb. LIX (1925), Beibl. 132/42.— Endocarp papery, composed of thick-walled cells; seeds 1- or 2; fruit indehiscent.

Subsection 1. **ROBUSTAE** Manf., l.c. 42.— Walls of endocarp cells markedly thickened; leaves more or less coriaceous and rather lustrous, smooth, evergreen.

**L. lucidum* Ait. Hort. Kew. ed. II, 1 (1810) 19; DC. Prodr. VIII, 293; C.K. Schn. Laubholz. II, 796; Nakai, Fl. sylv. Koreana X, 31.— Ic.: Sims, Bot. Mag. LIII tab. 2565; Nakai, l.c.; C.K. Schn. l.c. 769, f. 500, 1-o; 797, f. 501, k-m.

Tree, to 10 m tall, evergreen; branchlets smooth, with round lenticels; leaf blade 8-17 cm long, 4-7 cm broad, oval to oblong-oval or broadly elliptic, abruptly narrowed upward, more or less rounded or rarely broadly cuneate or narrowed at base, coriaceous, smooth, lustrous above, revolute; the smooth petiole 1.5-2 cm long; inflorescence paniculate, pyramidal, to 20 cm long, at base to 17 cm broad, the rachis smooth and more or less angled; lower bracts often foliaceous; flowers sessile, with caducous
520 bracteoles; corolla tube equaling to sometimes nearly twice as long as the smooth calyx; corolla lobes equaling or slightly longer than the tube, reflexed; stamens twice the length of corolla tube; anthers transverse; style with stigma exserted from corolla tube; fruit initially obovoid or ovoid, in maturity subglobose, 0.6-0.8 mm in diameter. Fl. April; fr. July-August.

In the USSR cultivated only along the Black Sea coast of the Caucasus and on the south coast of the Crimea. A highly ornamental tree. **Gen. distr.:** Korea (Quelpart Island), China (Centr. and S.). Described from a garden specimen. Type in London.

**L. japonicum* Thunb. Fl. Jap. (1784) 17; DC. Prodr. VIII, 293; C.K. Schn. Laubholz. II, 795; Nakai, Fl. sylv. Koreana X, 33.— Ic.: Thunb. l.c. tab. I; C.K. Schn. l.c. 796; f. 500, d-k; 797, f. 501, d-g; Nakai, l.c.

Evergreen shrub, to 2 m tall; branchlets smooth, very young ones sometimes pubescent, lenticellate; leaf blade 6-7 cm long, 3 cm broad, smooth, coriaceous, oval or elliptic to suborbicular, narrowed or almost rounded at base, acuminate or acute or subobtuse, lustrous and dark green above, bluish beneath, obscurely veined in live specimens; petioles ca. 1 cm long, smooth; inflorescence broadly paniculate, pyramidal, 12-15 cm long, 7-8 cm broad, the rachis before anthesis pubescent, becoming glabrous; corolla tube twice the length of the smooth calyx; corolla lobes as long as or slightly shorter than the tube; filaments of stamens about equaling the corolla lobes; anthers transverse; style exserted from corolla tube; fruit ovaloid or ellipsoid, 0.7-1.2 cm long, 0.5-0.8 cm broad. Fl. April-May; fr. August.

Grown for ornament in gardens in the south of the USSR. There are various horticultural forms which differ in leaf coloration. **Gen. distr.:** Korea, N. China, Japan. Described from Japan. Type in Uppsala.

Subsection 2. *SINENSES* Mansf., l. c. 42. — Walls of endocarp cells less thick; leaves mostly membranous, more or less hairy when young, deciduous or rarely evergreen.

Series 1. **Subnitidae** V. Vassil. — Leaves somewhat lustrous above; fruit spherical or subspherical.

Beside *L. Tschonoskii*, this series contains the south Japanese species *L. ovalifolium* Hassk.

1. ***L. Tschonoskii*** Dcne. in Nouv. Arch. Mus. d'hist. nat. ser. 2, II,; (1878) 18; Koehne in Aschersons Fedtschr. (1904) 196. — *L. ciliatum* var. *Tschonoskii* (Dcne.) Mansfeld in Engl. Bot. Jahrb. LIX (1925) Beibl. 132/68, p.p. — *L. ciliatum* Rehder in Sargent, Trees a. Shrubs, I (1905) 141, p.p. — *L. Ibota* f. *Tschonoskii* (Dcne.) Nakai in Tokyo Bot. 521 Mag. XXXII (1918) 124. — Ic.: Koehne, l. c. 197 B, a-e; C.K. Schn. Laubholzsk. II, 802, f. 505, u-x, f. 508, a-d; Nakai, l. c.

Shrub, 1-2.5 m tall, the young branchlets pilose or pilulose, becoming glabrous in second year; leaves somewhat lustrous, narrowed at both ends, broadly lanceolate or ovate-oblong or narrowly elliptic, 2.0-6.5 cm long, 0.8-2 cm broad, short-apiculate or abruptly short-acuminate, ciliate-margined, pilose on the veins beneath; inflorescences axillary, paniculate, borne in large numbers along the branchlet, the lower ones with up to 6 leaves at base, contracted, dense, subcylindric, 2-4 cm long, 1.5-2 cm broad, the branches covered with short hairs; pedicels 0.5-1 mm long, both pedicel and calyx glabrous; corolla ca. 8 mm long; stamens slightly shorter than corolla lobes; fruit globose, somewhat lustrous, 8 mm in diameter; seeds obovoid, 4.5 mm long, 3 mm broad. Fl. June; fr. August (Plate XXVI, Figure 6).

Only cultivated in S. Sakhalin. **Gen. distr.:** Japan, Korea (Quelpart Island). Description based on a specimen from Honshu Island. Type in Paris.

Series 2. ***Ibotae*** V. Vassil. — Young branchlets hairy; leaves obtusish, round-tipped; fruit subglobose.

Beside the species described, the series also contains *L. Ibota* Sieb. from Centr. and S. Japan.

2. ***L. yezoense*** Nakai in Nakai a. Koidzumi, Trees a. Shrubs Jap. I (1922) 278; Sugawara, Ill. Fl. of Saghal. IV, 1539. — *L. acuminatum* Miyabe et Miyake, Fl. Saghal. (1915) 324, non Koehne. — *L. Ibota* Fr. Schm. Fl. Sachal. (1868) 159, non S. et Z. p.p. — *L. ciliatum* Mansf. in Engl. Bot. Jahrb. LIX (1924) Beibl. 132/67, non Blume, quoad pl. Sachal. — Ic.: Sugawara, l. c. 1536, tab. 704.

Shrub, 1-1.5 m tall, with a small number of slender branches, the shoots about the thickness of a finger, with dull smooth bark and round lenticels; young branchlets slender, light brown, covered with short hooked hairs; leaves 2-4 (5) cm long and 1.5-2 cm broad, short-petioled, thin, deciduous, obovate or lanceolate (f. *acuminata*), or elliptic, rarely orbicular, cuneate at base, round-tipped or slightly pointed at apex, mucronulate, green above, pale green beneath, glabrous on both sides or midrib and margin covered with short appressed hairs; flowers borne on short glabrous pedicels, with linear or narrowly lanceolate bracteoles;

calyx glabrous, to 1.5 mm long, subtruncate or with 4 broadly triangular segments; corolla yellowish-green, 4 times as long as the calyx, the lobes lanceolate obtusish; stamens equaling or slightly exceeding corolla; style
522 3-4 mm long; stigma simple; fruit a blackish-blue obovoid to subglobose berry, 7-8 mm long, 5.5 mm broad; seed solitary, 6 mm long, 1 mm broad, obovoid. Fl. June-July; fr. August (Plate XXVI, Figure 5).

Mountain woods. — Far East: Sakh. (S.). **Gen. distr.:** Japan (Hokkaido). Described from Japan. Type in Japan.

Section 2. **BACCATAE** Mansf. in Engl. Bot. Jahrb. LIX (1925) Beibl. 132/72. — Endocarp thin, membranous; walls of endocarp cells thin; cells mostly 2-4. A monotypic section.

3. **L. vulgare** L. Sp. pl. (1753) 7; Ldb. Fl. Ross. III, 39; Shmal'g., Fl. I, 205; C.K. Schn. Laubholz. II, 802; Mansf. in Engl. Bot. Jahrb. LIX, Beibl. 132/72. — Ic.: C.K. Schn. l.c. 799, f. 503, a-f, h-i, k.

Shrub, 2-5 m tall; young branchlets puberulous, becoming smooth, with scattered lenticels; leaf blade 2-7 cm long, 0.5-2 cm broad, oblong-elliptic to linear-elliptic, sometimes broadly elliptic or rarely suboval, narrowed at both ends or almost rounded at apex, rarely emarginate, mostly short-apiculate, subcoriaceous, slightly revolute, glabrous or minutely pubescent along the midrib; calyx ca. 0.5 mm long, glabrous; inflorescence paniculate, pyramidal, 9 cm long, 6 cm broad, open or fairly dense; inflorescence branches puberulous, more or less angled, the lower bracts often foliaceous; bracteoles narrowly lanceolate, ciliate-margined; calyx pubescent at base, ciliolate; corolla tube twice the length of calyx; corolla lobes as long as or slightly shorter than the tube; filaments of stamens about half the length of corolla lobes; anthers transverse; stigma nearly included or slightly exserted from corolla; fruit black, baccate, globose or obovoid, to 8 mm in diameter. Fl. June; fr. August-September.

River floodplains, dry mountain slopes, wooded gullies, and chalk outcrops. — European part: Bes., U. Dns., Bl., Crim.; Caucasus: Cisc. Dag., W.E., and S. Transc., Tal. **Gen. distr.:** Centr. and Atl. Eur., Med., Bal.-As. Min. Described from W. Europe. Type in London.

Economic importance. Widely grown for ornament in gardens and parks of the European part and of Soviet Central Asia. Ornamental both in flower and in fruit.

Genus 1150. **JASMINUM*** L.

L. Sp. pl. (1753) 7.

Flowers solitary or in few-flowered terminal panicles; calyx persistent, funnelform or campanulate, rarely subcylindric, 4-9-toothed or -lobed
523 or -parted; corolla salverform, the tube long-cylindric, the limb 4-6 (12)-parted, the lobes imbricated; stamens 2, with short filaments, included in corolla tube; pollen sacks opening sideways or almost inward, with nearly pointed connective; ovary bilocular; style filiform; stigma oblong or capitate, sometimes nearly 2-lobed, with 2 or rarely 3 or

* From the Arabic word *yasa min*, an Arab plant name.

4 ovules in each locule; fruit a 1- or 2-seeded berry or berrylike capsule; seeds erect, without albumen. Upright or creeping shrubs, with deciduous or evergreen trifoliate, imparipinnate, or rarely simple leaves.

The genus contains up to 200 species, distributed chiefly through tropical and subtropical Asia, Australia and Africa, with one species in Europe (Mediterranean) and one species in South America (Peru). There are only three wild-growing jasmines in the flora of the USSR.

Many species are cultivated as ornamentals and have been introduced into various countries.

1. Flowers yellow 2.
- + Flowers white 1. *J. officinale* L.
2. Leaves opposite; flowers solitary, sessile, appearing before leaves.
. **J. nudiflorum* Lindl.
- + Leaves alternate; flowers appearing after leaves. 3.
3. Leaves trifoliate; flowers in twos to fours at the end of short lateral
branchlets 2. *J. fruticans* L.
- + Leaves with 3 or 5 leaflets; flowers in few-flowered terminal
umbelliform panicles 3. *J. revolutum* Sims.

Section 1. **PRAEFLORENTIA** V. Vassil., sec.n. — Leaves opposite, trifoliate; flowers yellow, appearing before leaves; calyx with long teeth.

**J. nudiflorum* Lindl. in Journ. of the Hortic. Soc. in London, I (1846) 153. — Ic.: C.K. Schn. Laubholz. II, 836, f. 526, b-c; 838, f. 527, a.

Shrub, to 1.5 m tall; branches straight, smooth, 4-angled, flexible, rod-shaped, green; leaves trifoliate, slightly hairy on both sides when young, becoming glabrous; leaflets usually ovate or ovate to oblong, often short-tapering at base, acute or obtusish or subulate at apex, 1.5-2 cm long, 6-8 mm broad, ciliate-margined, dark green above, pale green beneath, glabrous; flowers appearing before leaves, sessile, lateral, solitary, subtended by scalelike bracts; calyx large, with long lanceolate ciliate lobes; corolla yellow, sometimes golden-yellow (var. *aureum*), the tube about twice the length of calyx, the limb to 3 cm broad, with broad oval or broadly obovate obtusish lobes. Fl. second half of March-April.

In the USSR only cultivated in gardens of Soviet Central Asia. A beautifully flowering ornamental. Its habitat is N. China, where it is also cultivated. Grown in Japan and W. Europe, from S. Germany to the Mediterranean region, inclusive. Described in England from a garden specimen. Type in London.

Section 2. **PINNATIFOLIA** DC. Prodr. VIII (1844) 313. — Leaves opposite, imparipinnate; flowers white.

1. *J. officinale* L. Sp. pl. (1753) 7; Pall. Fl. Ross. II, 33; M.B. Fl. taur.-cauc. I, 5; III, 413; Ldb. Fl. Ross. III, 41; Dippel, Laubholz. I, 150; Kuzn. in Mat. Fl. Kavk. IV, 268; C.K. Schn. Laubholz. II, 837. — Ic.: Curtis Bot. Mag. I tab. 31; Rchb. Ic. Fl. Germ. 17, tab. 1077, 1; C.K. Schn. l.c. 836, f. 526, i-m; 838, f. 527, d-e.

Scandent shrub, the long slender smooth angled branches requiring support; leaflets mostly 2 or 3 pairs, oblong-lanceolate, commonly linear, acute or acuminate, the lateral sessile or short-petioluled, the terminal borne on a long winged petiolule, smooth, ciliate-margined, bright green above, somewhat paler beneath; flowers white, fragrant, long-pedicelled, in few-flowered umbelliform inflorescences; calyx cup-shaped, with 5 very long subulate segments; corolla tube $1\frac{1}{2}$ -2 times the length of calyx, narrow; corolla lobes 5, acuminate, the limb up to 5 cm broad. Fl. June; fr. August-September.

Gorges, on damp slopes. — Caucasus: W. Transc., S. Transc. (?)

Gen. distr.: Atl. Eur., Med., Bal.-As. Min., Arm.-Kurd., Iran., Ind. - Him. Described from Europe. Type in London.

Note. Highly decorative. Grown throughout the Mediterranean region; in the USSR — in the Caucasus. There are a number of horticultural forms.

Section 3. **ALTERNIFOLIA** DC. Prodr. VIII (1844) 312. — Leaves alternate, trifoliate or pinnate; flowers yellow.

2. **J. fruticans** L. Sp. pl. (1753) 6; Pall. Fl. Ross. II, 33; Ldb. Fl. Ross. III, 41; Shmal'g., Fl. II, 203; Dippel, Laubholz. I, 46; Kuzn. in Mat. Fl. Kavk. IV, 266; C. K. Schn. Laubholz. II, 839. — Ic.: C. K. Schn. l.c. 838, f. 527, f-g; 840, f. 528, k-n.

Upright shrub, 1-1.5 m tall, with flexible rodlike angled smooth green branches; leaves as a rule trifoliate, rarely with 1 or 2 leaflets; lateral leaflets elongate, sessile or sometimes minutely petiolulate, the terminal
525 leaflet strongly narrowed, spatulate, 1-2 cm long, 0.5-1 cm broad, petiolulate; all leaflets short-ciliate on the margin, glabrous on both sides, dark green above, somewhat paler beneath; flowers in cymes of 2-4 at the ends of lateral branchlets; calyx short-campanulate, with long subulate segments; corolla short-campanulate, with long subulate segments; corolla bright yellow, the narrow cylindric tube twice the length of calyx, the broad 5-parted limb to 2 cm in diameter, the lobes long and rounded at apex; fruit a berry, 0.5-0.8 cm in diameter. Fl. June-July; fr. August-September.

Woods and scrub, mostly of xerophytic type. — European part: U. Dns., Bes., Bl., Crim.; Caucasus: Cisc., Dag., W., E., and S. Transc., Tal.; Soviet Central Asia: Ar.-Casp., Mtn. Turkmen. **Gen. distr.:** Centr. and Atl. Eur., Med., Bal.-As. Min., Arm.-Kurd. Described from W. Europe. Type in London.

Note. Grown for ornament throughout its distribution area.

3. **J. revolutum** Sims in Curtis Bot. Mag. XLII (1814) tab. 1731, Dippel, Laubholz. I, 148; Boiss. Fl. or. IV, 42, Suppl. 43. — Ic.: Dippel, l.c., f. 93.

Upright shrub, 1-1.5 m tall, with arching smooth angled green branches; leaflets 3-4 pairs, ovate, oblong-ovate, or oblong, rounded or slightly narrowed and somewhat oblique at base, gradually tapering toward apex, 2.5-5 cm long, 1-1.5 cm broad, glabrous, dark green above, pale beneath; flowers fragrant, in few-flowered umbelliform inflorescences, subtended by bracts opposite the leaves; calyx campanulate, with 5 or 6 short acute

teeth; corolla 5-8-parted, yellow, the tube several times the length of calyx, the enlarged limb salverform, the round-tipped lobes reflexed; fruit a 2-seeded berry. Fl. July-August; fr. September.

Mountain slopes. — Soviet Central Asia: Pam.-Al. (Darvaza Range).

Gen. distr.: Iran. (Afghanistan), Ind.-Him. Described in England from a garden specimen. Type in London.

Note. A beautiful ornamental shrub, unfortunately not yet introduced into cultivation in the USSR. Probably, like most species of this genus, suitable for cultivation only in areas with relatively mild climate and not too long a winter.

Family CXXX. **GENTIANACEAE** DUMORT.*

Flowers bisexual, actinomorphic or rarely slightly zygomorphic, 526 4-5 (rarely 6-12)-merous, solitary or in a variety of cymose inflorescences; calyx gamosepalous, more or less deeply parted, sometimes split; corolla gamopetalous, infundibular or campanulate, rarely tubular or rotate, sometimes with plaits between the lobes prolonged into subsidiary lobes, sometimes with lobes flexuously fringed, and sometimes fimbriate within; yellow glands often present at petal base, in some species spurred; calyx and corolla usually persistent in fruit; stamens as many as and alternate with petals, the filaments slender or sometimes dilated; anthers mostly distinct, rarely united, basifixed or rarely versatile, slightly cordate at base; ovary superior, of two united carpels, sessile or stipitate, unilocular, with two parietal placentae and numerous ovules, rarely faintly to almost completely bilocular; style filiform, sometimes obsolescent, simple; stigma capitate, funnelform, or cylindrical 2-lobed; fruit a capsule, thinly or firmly coriaceous, dehiscing with 2 valves, rarely a berry; seeds small, commonly numerous, albuminous, with a small embryo. Perennial and annual herbs with entire opposite or rarely alternate exstipulate leaves.

1. Corolla with 4 spurs 1159. **Halenia** Borkh.
- + Corolla not spurred 2.
2. Corolla tube not shorter than the lobes. 3.
- + Corolla tube much shorter than the lobes 5.
3. Anthers after anthesis spirally coiled; ovary and capsule nearly bilocular; corolla claviform, with long slender tube and pink or white limb. 1151. **Centaurium** Gilib.
- + Anthers not coiled; ovary and capsule clearly unilocular; corolla tubular-campanulate or infundibular, neither pink nor white 4.
4. Stem creeping or climbing; flowers nodding . . . 1153. **Crawfordia** Wall.
- + Stems erect, sometimes pendent, but never creeping or climbing. 1154. **Gentiana** L.
5. Calyx and corolla lobes and stamens 6-8; corolla bright yellow 1152. **Blackstonia** Huds.
- + Calyx and corolla lobes and stamens 4 or 5; corolla otherwise colored. 6.
6. Corolla lobes with a pair of nectar pits at base, not fringed, with a small simple scale on the outside; flowers small, ca. 5 mm long. 1156. **Anagallidium** Griseb.
- + Nectariferous pits fringed; flowers larger, 7-15 (20) mm long. 7.

* Prepared by A. A. Grossgeim. The author contributed only a full treatment of the genus *Gentiana*. The other genera of the family have been contributed by the editorial board. The drawings were executed under the supervision of L. A. Smol'yaninova.

7. Stigma sessile, descending down the sutures of ovary as two rough grooved stripes; flowers solitary, long-pedicelated 1155. *Lomatogonium* A.Br.
- + Stigma distinct; flowers commonly in clusters with unequal pedicels. 8.
8. Nectariferous pits oblong; annuals 1157. *Ophelia* D. Don.
- + Nectariferous pits round; perennials 1158. *Swertia* L.

Tribe 1. **ERYTHRAEINAE** Gilg in Engl. — Pr. Pflanzenf. IV, 2 (1895)
 62.— Capsule nearly bilocular due to intrusion of laminate placentae; stigma medium size; exine clearly separated from intine, smooth or very rarely puncticulate.

Genus 1151. **CENTAURIUM** * GILIB.

Gilib. Fl. lithuan. I (1781) 35.—*Erythraea* Renealm ex Borkh. in Roem. Arch. I, 1 (1796) 28.

Flowers 5- or rarely 4-merous; calyx tubular, angled, commonly deeply parted; corolla tube cylindric, elongate, the limb nearly flat; stamens 5 or 4, inserted on the upper part of the tube, the filaments slender; ovary unilocular style slender, filiform; stigma 2-lobed, rarely simple globose; capsule 2-valved, obscurely bilocular or unilocular, the seeds attached on the sutures; seeds numerous, reticulately pitted. Perennials or annuals; inflorescence cymose, often forked and loose, rarely compact and corymbiform, commonly many-flowered; flowers pink, rarely white or yellow.

About 50 species, distributed through Eurasia, North and South America, and Australia.

1. Flowers borne on inflorescence branches, in spikelike arrangement. 7. *C. spicatum* (L.) Fritch.
- + Inflorescence branches not spikelike 2.
2. Inflorescence commonly forked, open, with oblique branches; bracteoles of lateral flowers more or less distant (to 6-10 mm) from calyx. 3.
- + Inflorescence more or less compact, with erect branches; bracteoles of all flowers close to calyx. 5.
3. Flowers white; leaves more or less elongated; inflorescence very open. 2. *C. Meyeri* (Bge.) Druce.
- 528 + Flowers pink; leaves less elongated; inflorescence forked 4.
4. Small plants, 5-10 (15) cm tall; corolla 10-13 mm long; leaves distant. 1. *C. pulchellum* (Schwartz) Druce.
- + A taller plant; corolla tube very slender; leaves closely approximate and often imbricated. 3. *C. tenuiflorum* (Hoffmsg. et Link) Fritsch.
5. Cauline leaves herbaceous; lanceolate, oblong or ovate, commonly 5-nerved 4. *C. umbellatum* Gilib.
- + Cauline leaves more or less fleshy, linear 6.
6. Flowers 13-15 mm long; the whole plant quite smooth, rather low; leaves rather distinctly fleshy 5. *C. vulgare* Raf.

* From Greek *Kentaurion*, the name of a red-flowered plant mentioned by Dioscorides, presumably *Centaureum umbellatum*. According to Pliny, the plant was used by the Centaur Chiron.

+ Flowers 10-12 mm long; the plant more or less scabrous
. 6. *C. uliginosum* (W. et K.) Beck.

Section 1. **EUERYTHRAEA** Griseb. Gen. et Sp. Gent. (1839) 138.—
Corolla pink, rarely white; style simple; stigma 2-lobed, with flat oval
or subglobose lobes; inflorescence paniculately dichotomous or corymbose.

Series 1. **Pulchella** Grossh.—Flowers pedicellate, far removed
from bracteoles.

1. **C. pulchellum** (Schwartz) Druce, Fl. Oxf. (1897) 342; E. Krause in
Sturm, Fl. Deutschl. ed. 2, X (1903) 16; Grossg. Fl. Kavk. III, 225.—
C. pulchellum var. *ramosissimum* Gilmour in Kew Bull. (1937)
501.—*Gentiana pulchella* Swartz. in Vet. Acad. Handl. (1783) 85,
tab. 3, f. 8, 9.—*G. Centaurium* L. Sp. pl. (1753) 230.—*Erythraea*
ramosissima Pers. Syn. I (1805) 283; M.B. Fl. taur.-cauc. I, 167;
Boiss. Fl. or. IV, 67.—*E. ramosissima* var. *pulchella* (Fr.)
Griseb. Gent. (1839) 145; Kuzn. in Mat. Fl. Kavk. III, 1, 272.—
E. pulchella Horn. in Fl. Dan. X (1809) tab. 1637; Fries, Novit. Fl.
suec. ed. 2, 74; Ldb. Fl. Ross. III, 50; Shmal'g., Fl. II, 216.—
E. caspica Fisch. ex Griseb. Gent. (1839) 145; Ldb. Fl. Ross. III,
51.—*E. candelabrum* H. Lindb. in Acta Soc. Sc. Fenn. n.s. B, 1, 2
(1938) 118, icon.—Ic.: Rchb. Ic. Fl. Germ. XVII, tab. 1061; Syreishch.
Ill. Fl. Mosk. gub. III, 40.—Exs.: GRF, No. 376; Pl. Finland. exs.
No. 326; Fl. exs. Austro-Hung. No. 2971.

Annual, glabrous, green; stems sharply 4-angled, 5-10 (15) cm long,
commonly forked nearly from base, with obliquely rising branches or rarely
stems simple, 1- or 2-flowered, 1-5 cm long (f. *pumilum* Kusn.), or
2-5 cm long, with short but numerous branches and thus flowers almost
capitately crowded (f. *pseudocapitatum* Grossh. h.l.); radical leaf
rosettes wanting; lowermost leaves ovate or oval, others elliptic or oblong,
529 obtuse or subobtuse, faintly 5-nerved, the uppermost oblong-lanceolate
to lanceolate, obtuse or acute; inflorescence commonly many-flowered;
lateral flowers brown on a pedicel to 10 mm long, the central flower
subsessile; bracteoles small, linear, those of lateral flowers distant from
calyx base; calyx tubular, the acute linear-subulate teeth about as long
as the tube but shorter than corolla tube; corolla 10-13 mm long, the limb
6-8 mm in diameter, pink, the tube slender; corolla lobes elliptic-oblong,
obtusish; capsule narrow, oblong-linear, 9-10 mm long; seeds minute
dark brown, irregularly globose. June-October.

Meadows, banks of rivers and ponds, dry wastelands, etc., from
lowlands to the upper mountain zone.—European part: Balt., U. Dnp.,
U.V., V.-Ka., U. Dns., M. Dnp., V.-Don, Bes., Bl., L. Don, L.V.,
Crim.; Caucasus: Cisc., Dag., W., S., and E. Transc., Tal.; Soviet
Central Asia: Ar.-Casp., Balkh., T.Sh., Pam.-Al. **Gen. distr.:** Scand.,
Atl., Centr. and S. Eur., Bal.-As. Min. Described from Sweden. Type
in Stockholm.

2. **C. Meyeri** (Bge.) Druce in Rep. Bot. Exch. Cl. Brit. Isles, 1916
(1917) 613; Kryl. Fl. Zap. Sib. IX, 2168; Grossg. Fl. Kavk. III, 225.—

C. pulchellum var. *altaicum* Kit. et Hara in Journ. Jap. Bot. XIII (1937) 26.—*Erythraea Meyeri* Bge. in Ldb. Fl. alt. I (1829) 220; Fl. Yugo-Vost. VI, 47.—*E. pulchella* β . *albiflora* Ldb. Fl. Ross. III (1846) 51; Shmal'g. Fl. II, 217; Kryl. Fl. Alt. III, 830.—*E. ramosissima* M.B. Fl. taur.-cauc. I (1808) 167, p.p.—*E. ramosissima* Pers. var. *altaica* Griseb. in DC. Prodr. IX (1845) 57.—*E. ramosissima* β . *albiflora* Boiss. Fl. or. IV (1879) 67.—*E. ramosissima* var. *Meyeri* (Bge.) Kusn. in Mat. Fl. Kavk. IV, 1 (1903) 270.—*E. pulchella* Horn. var. *altaica* Kitag. in Rep. First Sc. Exp. Manch. sect. 4 (1936) 39.—Ic.: Ldb. Ic. Pl. Fl. Ross. II (1830) tab. 159.—Exs.: Fl. cauc. exs. No. 44.

Annual, glabrous, light green, 10-30 (40) cm tall, sometimes 2-5 cm tall (f. *pumilum* Kusn.); stems 4-angled, above and below the middle more or less profusely furnished with upright branches; radical rosette wanting; cauline leaves oblong-ovate or oblong-linear, acutish, obscurely 3-lobed, those near the top of inflorescence very narrow and somewhat elongated; inflorescence many-flowered, with somewhat spreading pedicels; lateral flowers borne on pedicels up to 10 mm long; bracteoles small, linear, distant from calyx base; calyx tubular, the acute narrowly linear-subulate teeth about as long as the tube but shorter than corolla tube; corolla 12-13 mm long, the limb 6-8 mm in diameter, the narrow tube exerted from calyx, the lobes white elliptic-oblong, obtusish; capsule almost unilocular, oblong-linear, 9-10 mm long; seeds exceedingly minute, dark brown, irregularly globose. May-October.

Meadows, wet and saline places, up to the lower mountain zone.—European part: V.-Ka. (?), Transv., Bes., Bl., L. Don, L. V., Crim.; Caucasus: Cisc., W., E., and S. Transc. (rare); W. Siberia: Alt.; Soviet Central Asia: Ar.-Casp., Balkh., T.Sh., Syr D., Kyz. K., Pam.-Al., Mtn. Turkm. **Gen. distr.:** Dzu.-Kash., Manchuria. Described from Ablaketka on the Irtysh. Type in Leningrad.

3. *C. tenuiflorum* (Hoffmsg. et Link) Fritsch in Mitt. Naturwiss. Ver. Wien (1907) 97; Grossg. Fl. Kavk. III, 225.—*Erythraea tenuiflora* Hoffmsg. et Link, Fl. Portug. I (1809) 354; Kuzn. in Mat. Fl. Kavk. IV, 1, 284.—*E. latifolia* Boiss. Fl. or. IV (1879) 67, non Sm.—Ic.: Hoffmsg. et Link, l.c. tab. 67.

Annual, glabrous, green; stems 15-25 (40) cm long, 4-angled, usually numerous from base, with straight suberect branches; leaves of the obsolescent radical rosette deciduous about blossom time, oblong-oval to oblong; cauline leaves proximate and commonly contiguous, the lower oblong-oval, faintly 5-nerved, 2-4 cm long, 10-15 mm broad, subacute, the upper rather narrow, lance-oblong, acute; inflorescence commonly many-flowered, more or less compact, rarely fairly loose; pedicels short; bracteoles of lateral flowers narrowly subulate, small; calyx 8-9 mm long, narrowly tubular, parted to 2/3-3/4, the linear-subulate teeth shorter than corollatube; corolla 10-12 (13) mm long, the limb 8-10 mm in diameter, the narrow whitish tube enlarged above throat, the pink lobes narrowly oblong acutish; capsule narrowly linear-oblong, 8-10 mm long; seeds minute, trigonous-globose, dark brown. June-October.

Saline wet meadows, damp coastal sands, etc.—European part: Crim.; Caucasus: Cisc. (rare), W., E., and S. Transc. **Gen. distr.:** W. and E. Med., Bal.-As. Min. Described from Portugal. Type in Lisbon (?).

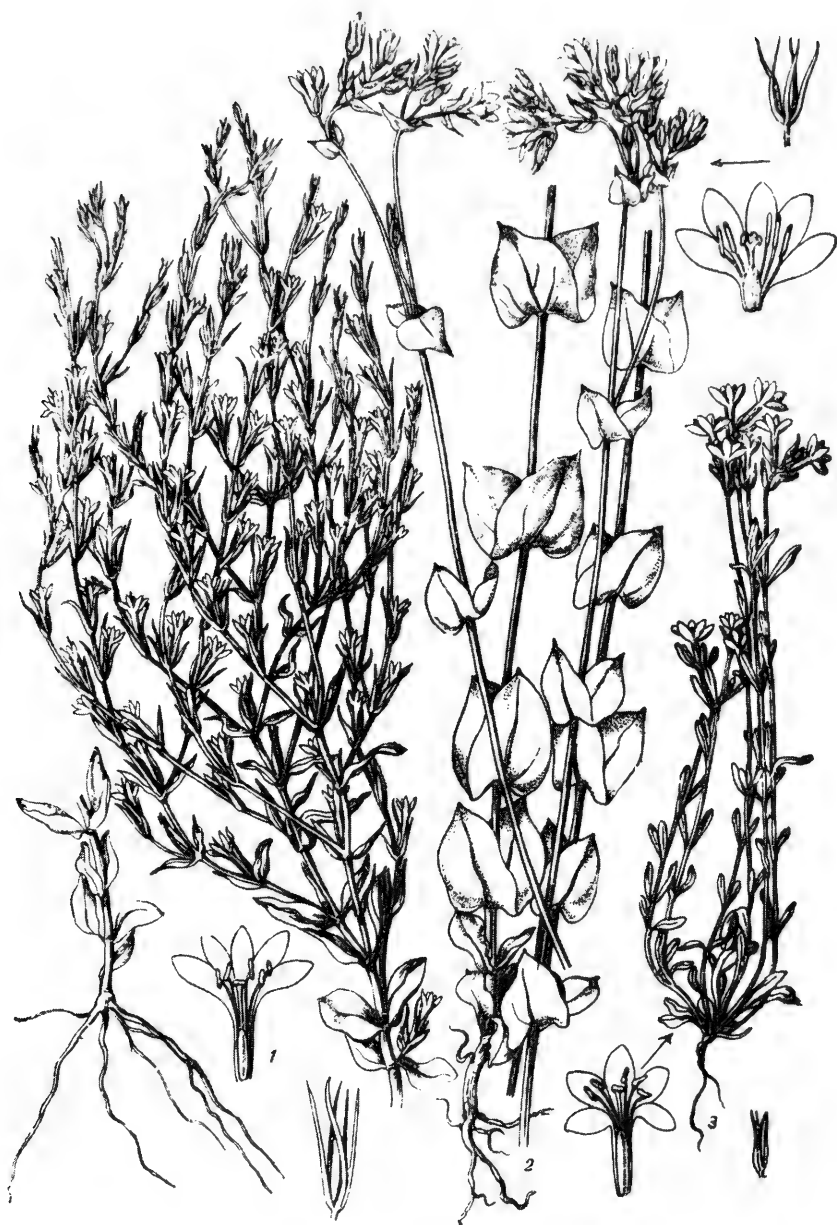


Plate XXVII

1. *Centaurea spicata* (L.) Fritsch.— 2. *Blackstonia perfoliata* (L.) Huds.—
 3. *Centaurea vulgare* Raf.

Series 2. **Umbellata** Grossh. — Flowers sessile, the bracteoles close to flower base; cauline leaves lanceolate, 5-nerved.

- 533 4. **C. umbellatum** Gilib. Fl. lithuan. I (1781) 135; Grossg. Fl. Kavk. III, 226, cum var.; Kryl. Fl. Zap. Sib. IX, 2167. — **C. turcicum** (Vel.) Druce in Rep. Bot. Exch. Cl. Brit. Isles, 1916 (1917) 614. — **Gentiana Centaurium** L. Sp. pl. (1753) 229, p.p. — **Erythraea centaurium** Pers. Syn. I (1805) 283; M.B. Fl. taur.-cauc. I, 166, p.p.; Ldb. Fl. Ross. III, 49; Shmal'g. Fl. II, 216; Boiss. Fl. or. IV, 68 (cum var.); Kuzn. in Mat. Fl. Kavk. IV, 1, 287, cum var. — **E. turcica** Vel. Fl. Bulg. (1891) 384. — Ic.: Rchb. Ic. Fl. Germ. XVII, tab. 1061; Varming, Russk. lek. rast. III, Plate 74; Kom. Sbor. sushkairazv. lek. rast., Plate 22. — Exs.: GRF, No. 930; Fl. pl. exs. No. 367; Fl. exs. Austro-Hung. No. 2969; Fl. exs. Reipubl. Bohem.-Sloven. No. 54.

Biennial, glabrous, green; stems straight, solitary or 2-5 from common base, 4-angled, 10-40 cm tall, in upper part branched, the branches upright; rosulate leaves persistent at flowering time, oblanceolate-ovate, the cauline distant, faintly 5-nerved, smooth-margined, elliptic-oblong, mostly obtuse, subacute; inflorescence few-flowered, corymbose-paniculate; lateral flowers with 2 small linear-subulate bracteoles inserted just below the calyx; calyx tubular, 4-6 mm long, parted down to or below the middle, the linear-subulate acute teeth shorter than or rarely equaling the corolla tube; corolla 12-15 mm long, about 10 mm in diameter at throat, the slender yellowish tube slightly constricted below the throat; corolla lobes bright pink, oval, obtusish; capsule narrowly oblong, ca. 10 mm long; seeds numerous, irregularly globose, brownish. June-October.

River floodplains, wood margins, wastelands, from lowlands to the upper mountain zone. — European part: Balt., Kar.-Lap., Lad.-Ilm., Dv.-Pech., U. Dnp., U. V., V.-Ka., U. Dns., M. Dnp., V.-Don, Bes., Bl., L. Don, Transv., L. V., Crim.; Caucasus: all regions; W. Siberia: Alt. (Barnaul); Soviet Central Asia: Syr D., Pam.-Al., Mtn. Turkmen. **Gen. distr.:** Scand., Atl. and Centr. Eur., Med., Bal.-As. Min. Described from Lithuania. Type in Paris.

Series 3. **Vulgares** Grossh. — Flowers sessile, the bracteoles close to flowers; leaves linear, 3-parted.

- 534 5. **C. vulgare** Raf. Danm. och Holst. Fl. II (1800) 72; Grossg. Fl. Kavk. III, 225. — **Gentiana Centaurium** β . L. Sp. pl. (1753) 230. — **Erythraea linariaefolia** Pers. Syn. I (1805) 283; Ldb. Fl. Ross. III (1846) 50; Shmal'g. Fl. II, 216. — Ic.: Rchb. Ic. Fl. Germ. XVII, tab. 1061; Schl., Lang. u. Schenk, Fl. Deutschl. ed. 5, XVI, tab. 1571. — Exs.: GRF, No. 71; Pl. Finland. exs. No. 325, 863.
- Annual, glabrous, pale green; stems terete, sulcate, solitary or numerous from about the base, straight, in upper part forked, with upright branches, (4) 7-15 (20) cm long; rosulate leaves persistent in flower, congested, numerous, somewhat fleshy, cuneate or spatulate, the cauline linear or oblong-linear, obtuse, 1-3-nerved, slightly narrowed toward base, (4) 10-15-(20) mm long, 1.3 (4) mm broad, glabrous; inflorescence corymbose; lateral flowers with 2 bracteoles inserted at base of or little removed from flower, small, linear; calyx tubular, 6-9 mm long, parted to lower third or nearly down to base into narrowly linear-subulate acute

teeth, these equaling or slightly shorter than corolla tube; corolla 13-15 mm long, the tube greenish, constructed below the throat, the limb 10-11 mm in diameter, bright pink, the lobes rather obtuse; capsule linear-oblong, 8-10 mm long; seeds very small, angled-globose, dark brown. June-August (Plate XXVII, Figure 3).

Coastal sands, river valleys, and meadows.—European part: Lad.-Ilm., Balt., U. Dnp., M. Dnp., U. Dns.; Caucasus: Cisc. (? on the Kuban).

Gen. distr.: Scand., Centr. Eur. Described from Denmark. Type in Copenhagen.

6. **C. uliginosum** (W. et K.) Beck in Fl. Nied. Oesterr. II (1893) 935.—*Chironia uliginosa* W. et K. Ic. et Descr. pl. rar. Hung. II (1812) 287.—*Erythraea uliginosa* Host, Fl. Aust. I (1827) 296.—Ic.: W. et K. l.c. tab. 259.—Exs.: Fl. exs. Austro-Hung. No. 2970.

Annual, more or less scabrous, pale green; stems terete, sulcate, as a rule numerous from a common base, straight, in upper part forked, 10-20 (30) cm long; rosulate leaves persistent in flower, congested, spatulate or obovate, numerous, the cauline scabrous-margined, linear to oblong-lanceolate, 10-20 cm long, (1) 3-4 (6) mm broad; inflorescence corymbose, compact; bracteoles small, linear-subulate; calyx ca. 8 mm long, parted nearly down to base, the narrowly lance-subulate scabrous teeth much shorter than corolla tube; corolla 10-12 mm long, the whitish tube considerably constricted below the throat, the limb 8-9 (10) mm in diameter, bright pink, the lobes oval obtusish; capsule linear-oblong, 8-10 mm long; seeds minute, angled-globose, dark brown. June-October.

Saline meadows, saline sands, borders of swamps.—European part: M. Dnp., Bl., L. Don, Transv., L. V.; Caucasus: Cisc.; Soviet Central Asia: Ar.-Casp., Kara K. (W.). **Gen. distr.:** Centr. and S. Eur. Described from Hungary. Type in Vienna.

535 Section 2. **SPICARIA** Grissb. Gent. (1839) 147.—Corolla pink; style simple; stigma funnelform, with indistinct united lobes; inflorescence branches spikelike.

7. **C. spicatum** (L.) Fritsch in Mitt. Naturwiss. Ver. Wien (1907) 97.—*Gentiana spicata* L. Sp. pl. (1753) 230.—*Erythraea spicata* Pers. Syn. I (1805) 283; Ldb. Fl. Ross. III, 51; Boiss. Fl. or. IV, 69; Shmal'g. Fl. II, 217; Kuzn. in Mat. Fl. Kavk. IV, 1, 299.—Ic.: Rchb. Ic. Fl. Germ. XVII, tab. 1061; Fedch. and Fler. Evrop. Rossii, 751.—Exs.: GRF, No. 1785; Fl. exs. Austro-Hung. No. 183.

Annual, glabrous, pale green, (4) 10-40 cm tall; stems 4-angled, commonly branched from lower part, the branches numerous upright; rosulate leaves broadly ovate, marcescent, the cauline congested, elliptic-oblong to lanceolate, rounded at base, acutish, faintly 5-nerved; flowers solitary or in pairs, thus inflorescence branches loosely spikelike; bracteoles two, linear-subulate, as long as or shorter than the flower; calyx tubular, the linear-subulate teeth longer than the tube to nearly equaling the corolla; corolla ca. 10 mm long, the tube slender, the pink limb ca. 6-8 mm in diameter, the lobes ovate-oblong, obtusish; capsule elongate-oblong, ca. 10 mm long; seeds numerous, very small, angled-globose, brownish. May-October (Plate XXVII, Figure 1).

Saline meadows and lowland shores.—European part: Bl., L. Don, L. V., Crim.; Caucasus: Cisc., W., E., and S. Transc., Tal.; Soviet Central Asia: Ar.-Casp., Balkh., Syr. D., T. Sh., Pam.-Al., Kara K., Mtn. Turkmen. **Gen. distr.:** W. and E. Med., Bal.-As. Min., Iran., Dzu.-Kash. Described from S. Europe. Type in London.

Genus 1152. **BLACKSTONIA** * HUDS.

Huds. Fl. Angl. ed. 1 (1762) 146.—*Chlora* L. Mant. I (1767) 10.

Calyx 6-10-parted, the segments linear, convex on the outside; corolla rotate, with a very short inflated tube and 6-8 oblong corolla lobes; stamens 6-8, distinct, with slender filaments; anthers oblong to linear, straight; style long, bifid, with laminate stigmas; capsule unilocular; seeds numerous, rugose. Annual glaucescent herbs with yellow flowers.

The Mediterranean genus *Blackstonia* contains 5 or 6 rather vaguely determined species.

- 536 1. **B. perfoliata** (L.) Huds. Fl. Angl. ed. 1 (1762) 146; Grossg. Fl. Kavk. III, 226.—*Gentiana perfoliata* L. Sp. pl. (1753) 335.—*Chlora perfoliata* Willd. Sp. pl. II (1799) 340; Griseb. Gent. 116; Ldb. Fl. Ross. III, 52; Boiss. Fl. or. IV, 66; Shmal'g. Fl. II, 216; Kuzn. in Mat. Fl. Kavk. IV, 1, 300.—Ic.: Engl. Bot. 60; Rchb. Ic. Fl. Germ. tab. 19.—Exs.: GRF, No. 375.

Annual, glabrous, intensely glaucous; stem terete, straight, simple, with a many-flowered inflorescence at the top, (10) 20-40 (50) cm long, rarely stem single-flowered; radical leaves sessile, elliptic-oblong, narrowed at base to subpetiolate, 10-30 mm long, the cauline opposite, triangular-ovate, acute, 15-20 (30) mm long, 10-20 mm broad, broadly united in pairs to 10 mm and higher up; calyx 4-5 mm long, the segments sublinear, acute, faintly 1-3-nerved, rarely nearly equaling the corolla; corolla 8-10 mm long, bright yellow, the lobes oblong obtuse; capsule ellipsoid, ca. 10 mm long; seeds numerous, very small, ca. 0.1-0.2 mm long, ovaloid, rugose, dark brown. June-September (Plate XXVII, Figure 2).

Wet meadows, wood margins and glades.—European part: Crim. (S. Coast); Caucasus: W. Transc. **Gen. distr.:** Centr. and Atl. Eur., Med., Bal.-As. Min. Described from France. Type in London.

Tribe 2. **GENTIANINAE** Gilg in Engl.-Pr. Pflanzenf. IV, 2 (1895) 62.—Capsule clearly unilocular; pollen grains large; exine very finely tuberculate, the tubercles arranged in distinct rows or seriate.

* Named after J. Blackstone, an investigator of English flora, contemporary with Linnaeus.

Genus 1153. **CRAWFURDIA** * WALL.

Wall. Tent. Fl. napal. II (1826) 63.—*Pterygocalyx* Maxim. in Mém. sav. étrang. Acad. Sc. Petersb. IX (1859) 198, tab. 9.—*Golowninia* Maxim. in Bull. Acad. Sc. Petersb. IV (1862) 252.

Flowers 4- or 5-merous, nodding; calyx tubular, smooth or the ribs keeled or winged, the segments widely divergent; corolla elongated, campanulate or tubular-campanulate or tubular-funnelform, the lobes erect or slightly spreading; stamens with slender filaments, included in corolla tube; anthers ovoid-subulate; ovary sessile or stipitate, with a slender style and 2 narrow or enlarged stigmas; fruit berrylike or a coriaceous capsule; seeds lenticular, winged. Climbing or creeping herbs.

The genus *Crawfordia* contains about 7 species, in tropical and subtropical Asia.

Genus type — *C. speciosa* Wall. (Nepal).

- 537 1. Flowers 4-merous; corolla lobes obtuse; ovary sessile; calyx teeth much shorter than the tube. 1. *C. volubilis* (Maxim.) Makino.
+ Flowers 5-merous; corolla lobes acuminate; ovary stipitate; calyx teeth longer than the tube 2. *C. japonica* Sieb. et Zucc.

1. *C. volubilis* (Maxim.) Makino in Tokyo Bot. Mag. IV (1890) 86; Gilg. in Engl.-Pr. Pflanzenf. IV, 1 (1895) 79.—*Pterygocalyx volubilis* Maxim. Prim. Fl. amur. (1859) 198.—*C. pterygocalyx* Hemsley in Journ. Linn. Soc. XXVI (1890) 123; Kom. and Alis. Oprod. rast. Dal'nevost kr. II, 863.—Ic.: Kom. and Alis. l.c. Plate 262, 6.

Annual, green; stem creeping, slender, ca. 1 m long, with strongly elongated internodes; leaves opposite, suboval-lanceolate to lanceolate, narrowed at base into a short petiole, gradually acuminate toward apex, 1-3-nerved, 2-4 cm long, 6-8 (10) mm broad; flowers 4-merous, solitary or in twos or threes, pendant; calyx tubular, narrowly winged from the ribs, 15-18 mm long, the short slender acute teeth many times shorter than the tube, separated by broad sinuses; corolla white in lower part, 20-23 mm long, the azure-blue limb 5-6 (8) mm across, the lobes oval-oblong, obtuse, 4-5 mm long; ovary sessile, with a short style and enlarged fimbriate stigma; capsule oblong; seeds winged. August-September.

Woods, scrub, and wood margins.—Far East: Ze.-Bu., Uss., Sakh.

Gen. distr.: China, Japan. Described from the Amur River. Type in Leningrad.

2. *C. japonica* Sieb. et Zucc. in Abh. Akad. Muench. IV, 3 (1846) 160.—*Golowninia japonica* (Sieb. et Zucc.) Maxim. in Bull. Acad. Sc. Petersb. IV (1862) 250. 252.—*Tripterospermum japonicum* Maxim. ex Ho da, Nom. pl. Jap. (1939) 281.—Ic.: Maxim. l.c. tab. ad pag. 272.;

Annual, green; stem creeping, slender, up to 1 m and more, with strongly elongated internodes; leaves opposite, 3-nerved, oval-ovate, acute, subcordate or truncate at base; narrowed into a short petiole, (2) 3-5 cm long, 10-30 mm broad; flowers 5-merous, nodding, solitary or rarely in pairs in the leaf axils; calyx funnelform-tubular, keeled at the ribs, 13-15 mm long, half as long as corolla, the narrowly linear-subulate teeth

* Derived from a surname.

longer than or rarely as long as the tube, separated by obtuse broad sinuses; corolla tubular-campanulate, 20-25 mm long, the limb ca. 6 mm across, the lobes triangular-ovate, finely pointed, 4-5 mm long; ovary long stipitate, 538 with a long slender style, the stigma lobes thin and arched-recurved; capsule oblong, stipitate. July-August.

Bamboo thickets. — Far East: Sakh. (southern Kurile Islands). **Gen. distr.:** Jap.-Ch., Ceylon. Described from Japan. Type in Florence.

Genus 1154. **GENTIANA** * L.

L. Sp. pl. (1753) 227; Frölich, Gent. (1790) 19; Bge. in Nouv. Mem. Soc. Nat. Mosc. I (1829) 209; Griseb, Gentian, (1839) 200; Kuzn, subgenus *Eugentiana* Kuzn, of the genus *Gentiana*, in Tr. SPb. obshch. estestv. (1894) 3.

Flowers 5- or rarely 4-merous, very rarely 6-8-merous; corolla rotate, tubular, campanulate, infundibular, or clavate, bare or fringed within, plaited between the lobes or without plaits; stamens included in corolla tube; stigmas 2, distinct, recurved, or more or less salverformly united; style short or sometimes obsolete; capsule 2-valved, unilocular, with numerous seeds.

The genus *Gentiana* contains more than 300 species, distributed chiefly in temperate regions of the northern hemisphere; few in the southern hemisphere.

For precise determination of gentians, especially the annual ones, it is necessary to secure extensive collections, with some scores of specimens, since determination on the basis of individual specimens sometimes presents difficulties.

Key to Sections

1. Corolla plaited between the lobes (subgenus *Eugentiana* Kuzn.). 2.
- + Corolla not plaited between the lobes (subgenus *Gentianella* Kuzn.). 8.
2. Corolla rotate, deeply parted; plaits minute; flowers 5-7-merous; perennials with broad leaves Section 1. **Coelanthé** DC.
- + Corolla not rotate, 4- or 5-merous; plaits well developed. 3.
3. Stigmas distinct, not enlarged 4.
- + Stigmas horizontally or salverformly enlarged, fused. 7.
4. Basal rosette wanting; lower leaves small, scalelike; corolla limbless, with erect lobes; seeds often winged.
- Section 2. **Pneumonanthé** Neck.
- 539 + Lower leaves forming a basal rosette 5.
5. Base of stems clothed in fibrillose sheaths of old leaves; corolla limbless or limbed; seeds wingless, finely reticulate or smooth
- Section 4. **Aptera** Kuzn.
- + Base of stems not clothed in sheaths of old leaves 6.
6. Corolla limbless, with erect lobes; large; seeds white-squamaceous; plaits asymmetrical Section 3. **Frigida** Kuzn.

* According to Pliny, named after Gentius, the Illyrian, who adopted yellow gentian for use against the plague.

- + Corolla with distinct limb, commonly small, rarely large; seeds scaleless, smooth or reticulate; plaits symmetrical, large. Section 5. **Chondrophylla** Bge.
- 7. Corolla large, tubular-infundibular, with erect lobes; plaits asymmetrical; stigmas enlarged, toothed-fimbriate, slightly fused, becoming distinct Section 6. **Thylacites** Griseb.
- + Corolla clavate, with cylindric tube and broad limb; plaits symmetrical; stigmas fused into a globose club-shaped structure, toothed-fimbriate. Section 7. **Cyclostigma** Griseb.
- 8. Corolla fringed within. 9.
- + Corolla not fringed within 10.
- 9. The base of each petal bearing 1 or 2 fringed scales; corolla often subrotate, 4- or rarely 5-parted. Section 11. **Comastoma** Wettst.
- + Corolla with a fimbriate crown (except *G. Lipskyi* Kusn.), infundibular, the limb 5- or rarely 4-parted. Section 9. **Endotricha** Froel.
- 10. Corolla completely bare, 4- or 5-parted Section 10. **Arctophila** Griseb.
- + Corolla with fringed or ciliate petals (rarely bare); flowers 4-parted, large Section 8. **Crossopetalum** Froel.

Subgenus 1. **EUGENTIANA** Kusn. Subgenus *Eugentiana* Kusn. of the genus *Gentiana* (1894) 3. — Calyx with an inner membrane between the segments; petals connected by plaits; nectaries wanting; perennials, rarely annuals.

Section 1. **COELANTHE** DC. in Lam. et DC. Fl. franç. III (1805) 650. Corolla rotate, deeply parted; plaits small, asymmetrical, often wanting; flowers commonly large, 5-7-merous, yellow or purple; seeds broadly winged; perennials with broad petiolate leaves.

- 540 1. Corolla pure yellow, 18-25 mm long, parted nearly down to base into linear lobes 1. *G. lutea* L.
- + Corolla yellow and densely dark purple-spotted, 28-30 mm long, the short oval lobes much shorter than the tube 2. *G. punctata* L.

1. *G. lutea* L. Sp. pl. (1753) 227; Kusn. Subgenus *Eugentiana* (1894) 9; Kusn. Subg. *Eugentiana* (1904) 162. — Ic.: Varlin, Russk. lek. rast. III, Plate 75; Kom. Sbor, sushka i razv. lek. rast., Plate 15.

Perennial, glabrous, green; rootstock stout, vertical; stems (40) 60-90 cm long, stout (to 10 mm in diameter), coarse, unbranched; lower leaves oval-elliptic, narrowed upward, subacute, large, 7-nerved, to 23-25 cm long and to 12-13 cm broad, tapering into a petiole to 10 cm long; cauline leaves smaller, short-petioled, the upper ones sessile, ovate-elliptic, acute, 3-nerved, accreting at base into a short sheath; flowers usually numerous, borne on pedicels to 15 mm long, gathered in many-flowered clusters in the axils of the uppermost 3-7 leaf pairs and at the top of the stem; calyx membranous, 10-12 mm long, half the length of corolla, commonly split on one side and slightly inflated, 2-7-toothed, the teeth 3-4 mm long; corolla subrotate, yellow, not spotted or with few spots, 18-25 mm long; corolla lobes 5-7, linear, acutish, erect, 4-5 times the

length of tube; plaits commonly obsolescent; stamens distinct; capsule oblong-lanceolate, stipitate; seeds broadly winged. June-August.

Meadows and grassy slopes in the middle and upper mountain zones.—European part: U. Dns. (Carpathians). **Gen. distr.:** Centr. Eur., Bal.-As. Min. (Balkans). Described from W. Europe. Type in London.

2. **G. punctata** L. Sp. pl. (1753) 227; Kuzn. Subgenus Eugentiana (1894) 16; Kusn. Subgen. Eugentiana, 168.—Ic.: Rchb. Ic. Fl. Germ. XVII, Plate 1056.

Perennial, glabrous, green; rootstock stout, vertical; stems 20-40 cm long, stout, dense, unbranched; leaves elliptic, 6-9 (12) cm long, 3-6 cm broad, acute, 5-nerved, the lowermost tapering into a petiole, the others sessile, accreting at base into short sheaths; flowers crowded at the top of the stem and in smaller number in the axil of the uppermost leaf pair or rarely two upper leaf pairs; calyx membranous, 5-7 cm long, much shorter than corolla, unsplit or rarely split, 2-7-toothed, the teeth commonly broad, oblong to oblong-triangular, acute, 4-5 mm long or rarely shorter; corolla tubular, membranous, yellow, densely dark purple-spotted, 4-5 times the length of calyx, (25) 28-30 (33) mm long; corolla lobes 5-7, 541 broadly oval or oval, obtuse, erect, 4-5 mm long, much shorter than the tube; plaits very short, rounded; stamens fused, becoming distinct, narrowed toward base; seeds winged. June-July.

Meadows and grassy slopes in the middle and upper mountain zones.—European part: U. Dns. (Carpathians). **Gen. distr.:** Centr. Eur., Bal. As. Min. (Balkans). Described from Switzerland. Type in London.

Note. Grisebach reported for Kamchatka *G. purpurea* L. of the section *Coleanthe*. He even described a distinct variety, *G. purpurea* var. *kamtschatica* (DC. Prodr. IX (1845) 116) from Wormskjöld's specimen in Hooker's herbarium. V. L. Komarov, in "Flora poluostrova Kamchatki" (Flora of the Kamchatka Peninsula) maintains that these specimens were erroneously recorded for Kamchatka and that *G. purpurea* does not occur anywhere in Asia. Another investigator of Kamchatkan flora, E. Hultén, is of the same opinion.

Section 2. **PNEUMONANTHE** Neck. El. 2 (1791) 12.—Perennials; basal leaf rosette wanting; lower leaves small, scalelike; corolla limbless, with erect lobes; plaits well developed; seeds commonly winged, rarely wingless.

1. Flowers 4-merous, bluish-violet, 28-30 mm long (Dagestan) 19. **G. Overinii** (Kusn.) Grossh.
- + Flowers 5-merous 2.
2. Leaves linear or narrowly linear 3.
- + Leaves oval to narrowly lanceolate, never linear 5.
3. The narrowly linear leaves in whorls of 3-5; corolla yellowish inside, brownish-green outside 17. **G. paradoxa** Alb.
- + Leaves in pairs; corolla dark blue 4.
4. Corolla lobes obtuse; flowers sessile; anthers not fused 6. **G. triflora** Pall.
- + Corolla lobes acute; flowers pedicellate; anthers fused 7. **G. pneumonanthe** L.
5. Flowers yellow; corolla plaits triangular, biparted at the top 18. **G. gelida** M.B.

- + Flowers blue or azure; corolla plaits different 6.
6. Plaits entire or toothed, not fringed 7.
- + Plaits fringed 11.
7. Leaves ovate-lanceolate, enlarged toward base, attenuate-acuminate upward 8.
- + Leaves not attenuate-acuminate 10.
8. Flowers bracteolate; calyx never split; flowers in terminal clusters; plaits well developed 5. *G. scabra* Bge.
- 542 + Flowers without bracteoles; calyx often split; flowers in leaf axils; plaits short 9.
9. Calyx (16) 20-21 (28) mm long, twice the length of corolla, often split. 4. *G. schistocalyx* C. Koch.
- + Calyx (10) 14 (18) mm long, one third the length of corolla, mostly unsplit 3. *G. asclepiadea* L.
10. Flowers in a dense terminal head; the smaller calyx teeth triangular, not reflexed. 8. *G. Makinoi* Kusn.
- + Flowers solitary or in pairs in the axils of upper leaves and at the top of the stem; the smaller calyx teeth subulate, uncinately reflexed. 9. *G. axilliflora* Lévl. et Vnt.
11. Corolla lobes obtuse; leaves lanceolate, prolonged into a long slender point 11. *G. dschungerica* Rgl.
- + Corolla lobes acute; leaves not elongate-acuminate 12.
12. Leaves ovate-triangular, more or less distinctly cordate at base. 13. *G. cordifolia* C. Koch.
- + Leaves not cordate at base. 13.
13. Calyx segments foliaceous, oblong to subelliptic, (2) 4-6 mm broad. 16. *G. lagodechiana* (Kusn.) Grossh.
- + Calyx segments not foliaceous, toothlike 14.
14. Lower and middle leaves differing from each other, the lower suborbicular ca. 10 mm long, the middle ovate-lanceolate ca. 20 mm long. 15. *G. Kolakovskiyi* Doluch.
- + Lower leaves small, the transition to the larger cauline leaves gradual. 15.
15. Leaves crowded and imbricated, the lower triangular-ovate, the middle triangular-lanceolate, 8-12 mm long, 3-6 mm broad; corolla pale yellowish-blue, the lobe margins dark blue 14. *G. Grossheimii* Doluch.
- + Cauline leaves larger, 2-5 cm long; corolla dark blue 16.
16. Stems erect; leaves broader, ovate to oblong-ovate, 1-3 cm broad; calyx 25-33 mm long; corolla blackish-blue, green-spotted on the outside 10. *G. Fischeri* P. Smirn.
- 543 + Stems ascending, very rarely erect; leaves narrower, ovate to lanceolate, 8-20 mm broad; calyx 18-19 mm long; corolla dark blue. 17. *G. septemfida* Pall.

Series 1. *Asclepiadeae* Grossh. — Seeds winged; corolla plaits entire or toothed; leaves elongate-acuminate; flowers large, blue, 5-merous.

3. *G. asclepiadea* L. Sp. pl. (1753) 227; Ldb. Fl. Ross. III, 67; Kusn. Subgenus *Eugentiana*, 70, p.p.; Shmal'g. Fl. II, 313, p.p.; Kusn. Subg. *Eugentiana*, 216, p.p. — Ic.: Bot. Mag. XXVII, tab. 1078; Rchb. Ic. Fl.

Germ. XVII, tab. 1152; Gartenfl., XIV, tab. 479; XXXIV, tab. 275. — Exs.: GRF, No. 1375.

Perennial, glabrous, green; rootstock many-headed, stout; stems numerous (f. *cruciata* Wartm. et Schlatt.) or [?] arched (f. *pectinata* Wartm. et Schlatt.), (15) 40-60 (100) cm long, not branched, rarely more or less branched (f. *ramosa* Züscher), rather densely leafy; leaves sessile, ovate-lanceolate or the upper ones lanceolate, long-acuminate, (5) 6-9 (11) cm long, (1.8) 2-4 (5) cm broad, commonly 5-nerved, smooth-margined; flowers in the axils of the small upper leaves, numerous, erect, forming a second inflorescence (f. *pectinata*); calyx campanulate, (10) 14 (18) mm long, one third the length of corolla, sometimes split on one side, the unequal linear teeth (2.2) 3 (4) mm long, half the length of tube; corolla tubular clavate, 12-16 mm across below the throat, dark azure or blue, occasionally white (f. *albiflora* Murr.), (37) 43 (50) mm long; corolla lobes 1/6 to 1/7 of corolla length, triangular, acute or acuminate, the asymmetrical triangular plaits much shorter than the lobes; style short, with reflexed stigmas; capsule oblong, narrowed toward top and toward base, the stipe half as long as the capsule; seeds cylindric, 1-2 mm long, broadly winged throughout August-September.

Woods, wood margins, glades and meadows, from lowlands to the subalpine zone. — European part: Lad.-Ilm., U. Dns., **Gen. distr.:** Centr. and Atl. Eur. (SE France), W. Med. (Spain, Italy), Bal.-As. Min. (Balkans). Described from Switzerland. Type in London.

4. **G. schistocalyx** C. Koch in Linnaea, XVII (1843) 282. —

G. asclepiadea M.B. F. taur.-cauc. I (1808) 196, non L.; Ldb. Fl. Ross. III, 67; Boiss. Fl. or. IV, 76; Kuzn. Subgenus *Eugentiana*, 70; Shmal'g. Fl. II, 213, p.p.; in Mat. Fl. Kavk. IV, 309; Kusn. Subg. *Eugentiana*, 216. — *G. asclepiadea* var. *schistocalyx* Grossh. Fl. Kavk. III (1932) 229. — *G. asclepiadea* var. *macrocalyx* Somm. et Lev. in Tr. Bot. Sada, XVI (1900) 341. — Ic.: Sturm, Fl. III, 54; Gartenfl. XXXV, 274. — Exs.: Pl. or. exs. No. 346; Herb. Fl. Cauc. No. 383.

544 Perennial, glabrous, green; rootstock stout, many-headed; stems numerous, erect, (30) 40-70 (100) cm long, not branched, rather densely leafy; leaves sessile, ovate-lanceolate or the upper ones lanceolate, long-acuminate, 6-12.5 cm long, 2.5-4.5 (5) cm broad, commonly 5-nerved, smooth margined; flowers in the axils of slightly smaller leaves, numerous, erect, forming a more or less second inflorescence; calyx campanulate, (16) 20-21 (28) mm long, half the length of corolla, often split on one side; calyx teeth 4-9 mm long, unequal, narrowly linear, half the length of tube; corolla tubular-clavate, 12-16 mm across below the throat, dark azure or blue, very rarely nearly white, (37) 44 (50) mm long; corolla lobes 1/6 to 1/5 of corolla length, triangular, acute or acuminate, the asymmetrical triangular plaits much shorter than the lobes; style short, with reflexed stigmas; capsule oblong, narrowed toward the top and toward the base, the stipe half as long as the capsule; seeds 1-1.5 mm long, cylindric, broadly winged throughout. August-October (Plate XXVIII, Figure 1).

Wood margins and scrub, up to the upper mountain zone. — Caucasus: Cisc., W. and E. Transc., Dag., Tal. (rare). **Gen. distr.:** Bal.-As. Min. (Asia Minor). Described from Ossetia. Type in Berlin.



Plate XXVIII

1. *Gentiana schistocalyx* C. Koch.— 2. *G. gelida* M.B.— 3. *G. scabra* Bge.

5. **G. scabra** Bge. Verz. Alt. (1836) 21; Ldb. Fl. Ross. III. 68; Kom. and Alis. Opred. rast. Dal'nevost, kr. II, 863.— *G. scabra* α . *Bungeana* Kusn. f. *latifolia* et *angustifolia* Kusn. Subg. *Eugentiana* (1904) 220.— *G. Fortunei* Hook. Bot. Mag. XLVIII (1854), tab. 4776.— *G. scabra* β . *Fortunei* Kusn. Subgenus *Eugentiana* (1894) 76; Subg. *Eugentiana*, 222.— Ic.: Miyoshi, Atlas Jap. veg. (1908) tab. 70; Gard. Chron. XLVII, Suppl. (1910) 136.

Perennial, commonly dark green; rootstock with a tuft of stringy roots; stems numerous, erect, 30-50 cm long, especially in upper part sharply and minutely scabrous; leaves sessile, not united, ovate, acute or elongate-acuminate, 2.5-7 cm long, 2-3 cm broad (var. *Bungeana* Kusn.) or 0.7-2 cm broad (var. *angustifolia* Kusn.), dark green above, paler beneath, 3-nerved, sharply scaberulous on the margin and on the veins beneath; flowers in clusters at the top of the stem and the axils of upper leaves, sessile, enveloped in the terminal leaves; bracteoles lanceolate, somewhat shorter than to as long as the calyx; calyx campanulate, membranous, 7-12 mm long, half the length of corolla; calyx teeth commonly erect or spreading, rarely reflexed (var. *Fortunei* (Hook.) Kusn.), 10-12 mm long, linear, acute; corolla tubular-campanulate, uniformly dark blue or white-spotted (var. *Fortunei* (Hook.) Kusn.), 40-50 mm long, ca. 15 mm across below the throat; corolla lobes ovate, pointed-tipped; plaits half the length of corolla lobes, triangular, acuminate, 547 rarely bidentate; anthers distinct; style short; capsule oblong, stipitate; seeds linear, reticulate, winged throughout. August (Plate XXVIII, Figure 3).

Meadows, scrub, and wastelands.— E. Siberia: Len.-Kol, Dau.; Far East. Ze.-Bu., Uda, Uss. **Gen. distr.:** Japan, China. Described from Nerchinsk. Type in Leningrad.

Series 2. **Triflorae** Grossh.— Seeds winged; plaits of corolla toothed; leaves linear.

6. **G. triflora** Pall. Fl. Ross. II (1788) 105; Ldb. Fl. Ross. III, 66; Kuzn. Subgenus *Eugentiana*, 79; Kusn. Subg. *Eugentiana*, 225; Kom. and Alis. Opred. rast. Dal'nevost, kr. II, 863.— Ic.: Pall. Fl. Ross. II, tab. XCIII, f. 1; Gartenfl. XXXIV, tab. 1189.

Perennial, glabrous; green; stems erect, slender, 40-80 cm long, unbranched; lower leaves united into sheaths 5-10 mm long, the middle and upper ones distinct, lance-linear, (3) 5-8 (13) cm long, 4-8 mm broad (f. *angustifolia* Kusn.), rarely to 20 mm broad (f. *latifolia* Herder), smooth, single-nerved; flowers 5- or rarely 6-merous, sessile, crowded in few-flowered (1-3, to 5) clusters at the top of the stem and in the axils of upper leaves; calyx half the length of corolla, 15-20 mm long, membranous, campanulate, entire or sometimes split, the teeth unequal, some longer, to 16 mm, other shorter, 3-6 mm long, linear, acute; corolla tubular-clavate, dark blue, 35-45 mm long, 13-15 mm across below the throat; corolla lobes ovate, obtuse or subobtuse, muticous, one fifth to a quarter the length of tube; plaits very short, rising not more than 1-2 mm, triangular, acute; stamens distinct, the filaments dilated; style short; capsule oblong, stipitate; seeds linear, reticulate, winged throughout. August-September.

Meadows, glades, and scrub, up to 1200 m.— E. Siberia: Lena-Kol., Ang.-Say., Dau.; Far East: Ze.-Bu., Uda, Sakh. Endemic. Described from E. Siberia. Type in London.

7. **G. pneumonanthe** L. Sp. pl. (1753) 228; M.B. Fl. taur.-cauc. I, 196; Ldb. Fl. Ross. III, 67; Boiss. Fl. or. IV, 74; Kusn. Subgenus Eugentiana, 82; Shmal'g. Fl. II, 213; Kusn. in Mat. Fl. Kavk. IV, 1, 313; Kusn. Subg. Eugentiana, 228; Grossg. Fl. Kavk. III, 229; Fl. Yugo-Vostoka, VI, 48; Kryl., Fl. Zap. Sib. IX, 2180; Maevsk. Fl. ed. 7, 578.— Ic.: Rchb. Ic. Fl. Germ. XVII, tab. 1051; Gartenfl. XXVIII, 118; Syreishch., Ill. fl. Mosk. gub. III, 37; Maevsk., l.c. 240.— Exs.: GRF, No. 120.

548 Perennial, glabrous, dark green; rootstock short, cylindric, stout, densely covered with stringy root fibers; stems solitary or few from common rootstock, erect, 25-50 (65) cm long, rarely 4-15 cm long (f. minor Brot.), not branched, rarely strongly branched from base (f. diffusa Griseb.), clothed below in brownish ovate obtuse sheath scales, elsewhere rather densely leafy; leaves linear to linear-lanceolate, 3-7 cm long, 2-6 mm broad, commonly single-nerved, rarely broadly lanceolate, up to 15 mm broad and 3-5-nerved (f. latifolia Scholler), obtuse, united at base into short sheaths, more or less revolute; flowers terminal and in the axils of upper leaves, borne on pedicels as long as or shorter than calyx, with a pair of terminal leaves just below the calyx. calyx campanulate, two fifths to half the length of corolla, 15-20 mm long calyx teeth narrowly linear to linear-lanceolate, acute, 5-10 mm long, as long as to about twice the length of tube; corolla tubular-clavate, rich dark green, rarely nearly white (f. albiflora Murr.) or rose-red (f. roseiflora Lois.), with 5 green striated stripes within, 35-45 (50) mm long; corolla lobes ovate to broadly ovate, triangular-tipped, acute, one eighth to one fifth the length of tube; plaits asymmetrical, triangular, acute or subdentate, one sixth to one third the length of corolla lobes; ovary short-stipitate; style short; capsule oblong-lanceolate, narrowed toward the top; seeds fusiform, ca. 1.5 mm long, fluffy-reticulate, winged. July-October.

Meadows, wood margins and coppices, up to 1200 m.— European part: Balt., Lad.-Ilm., U. V., V.-Ka., U. Dnp., M. Dnp., V.-Don, Transv., U. Dns., Bl., L. Don, Ural (?); Caucasus: Cisc., W. Transc., W. Siberia: Ob, U. Tob., Irt.; E. Siberia: Ang.-Say., Dau. **Gen. distr.:** Scand., Centr. and Atl. Eur., Med. (N.), Bal.-As. Min. (Balkans). Described from Europe. Type in London.

Series 3. **Japonicae** Grossh.— Seeds narrowly winged; plaits of corolla entire; leaves lanceolate, not attenuated.

8. **G. Makinoi** Kusn. in Tr. Bot. Sada, XIII (1893) 60; Kuzn. Subgenus Engentiana, 89; Kusn. Subg. Eugentiana, 233.— Ic.: Sugawara, Ill. Fl. of Saghal. IV, tab. 706.

Perennial, glabrous, dark green; rootstock stout, short, cylindric, with stringy roots; stems solitary or few from common rootstock, 30-50 (70) cm long, rather sparsely leafy, the lowermost leaves scalelike, small, the cauline lanceolate or narrowly lance-ovate, acute, 3-5-nerved, smooth-margined, 4-6 cm long, 13-20 mm broad; flowers sessile, gathered in a

dense terminal head of 3 or 4; terminal leaves long, as long as or rarely shorter than flowered; calyx unsplit, campanulate, one third to half the length of corolla, 15-20 mm long; calyx teeth lance-linear, acutish, very unequal, the two longer ones 5-8 mm long, the other three small, triangular; 549 corolla tubular-clavate, blue, 40-45 mm long, the lobes many times shorter than the tube, oval, acute; plaits small, obliquely truncate, entire; anthers fused, becoming distinct; filaments of stamens narrowly winged; style short; capsule narrowed into a short stipe; seeds reticulate, narrowly winged. July-August.

Swampy meadows.— Far East: Sakh. **Gen. distr.:** Japan. Described from Japan. Type in Leningrad.

9. **G. axilliflora** Lév. et Van. in Bull. Soc. Bot. France, LIII (1906) 648.— *G. rigescens* Franch. var. *japonica* Kusn. in Tr. Bot. Sada, VIII (1893) 60; Subgenus *Eugentiana*, 92; Subg. *Eugentiana*, 235.

Perennial, glabrous, green; rootstock short, cylindric, stout, with stringy roots; stems solitary or several from the rootstock, erect, 40-60- (80) cm long, not branched; lower leaves almost scalelike, 2-8 mm long, rather abruptly followed by the middle and upper leaves, these 3-nerved, coriaceous, ovate-lanceolate or ovate-oblong, obtuse, (3) 6-12 (15) cm long, 15-30 mm broad; flowers singly or paired in clusters borne in the axils of upper leaves and at the top of the stem; calyx unsplit, campanulate, 13-18 mm long; calyx teeth unequal, the longest to 10 mm long; corolla tubular-clavate, blue, twice the length of calyx, ca. 40 mm long; corolla lobes oval, involute, acute, many times shorter than the tube; plaits small, triangular or truncate, entire; anthers distinct, on rather broadly winged filaments; ovary pubescent below; style short. August.

Wet forest meadows.— Far East: Sakh. **Gen. distr.:** Japan. Described from Japan (Yezo Islands [Hokkaido]). Type in Paris; paratype in Leningrad.

Series 4. **Septemfidae** A. Grossh.— Seeds wingless; plaits of corolla long-fringed.

10. **G. Fischeri** P. Smirn. Pl. alt. exs. (1937) No. 66.— *G. septemfida* Ldb. Fl. Ross. III (1846-1851) 67, non Pall. p.p.; Kryl. Fl. Zap. Sib. IX, 2182.— *G. septemfida* α . *genuina* Kusn. Subg. *Eugentiana* (1904) 240, p.p.— *G. Gebleri* Fisch. ex Bge. in Nouv. Mem. Soc. Nat. Mosc. I (VII) (1829) 218, nomen, non Ledebour ibid. 211.

550 Perennial; glabrous, dark green; rootstock stout, with stringy roots; stems numerous, erect, 20-55 cm long, covered at base with brown ovate scales, rather densely leafy; leaves sessile, united into sheaths, ovate to oblong-ovate, narrowed upward, obtuse, 2-5 cm long, 1-3 cm broad, 5- or rarely 7-nerved, scaberulous-margined; sheaths of lower leaves to 10 mm long, those of upper leaves shorter; flowers in compact terminal clusters, enveloped in reduced terminal leaves; calyx campanulate, 25-33 mm long, half the length of corolla; calyx teeth 12-18 mm long, 2-5 mm broad, unequal, linear-lanceolate or lanceolate, acute, scaberulous-margined, as long as the tube, the sinuses between the teeth obtuse; corolla tubular-clavate, blackish-blue, green-spotted inside, 35-45 mm long, rarely ca. 30 mm long, 15-19 mm across below the throat; corolla lobes ovate, obtusely pointed, one sixth to one fifth the length of t

the tube; plaits half as long as the lobes, profusely fringed; stamens with distinct anthers and flattened dilated filaments; style short; capsule oblong, the stipe half as long as the capsule. August-September.

Forest glades and meadows in the alpine tundra, from lowlands up to the alpine zone.—W. Siberia: Ob (S.), Irt., Alt.; Soviet Central Asia: Dzu.-Tarb. Endemic. Described from the Naryn Range, the village of Katon-Karagai at the source of the Ak-Bulak River. Type in Moscow.

11. **G. dschungarica** Rgl. in Tr. Bot. Sada, IV (1880) 334; Kuzn. Subgenus *Eugentiana*, 92; Kusn. Subg. *Eugentiana*, 236; Fedch., Rast. Turk. 648.

Perennial, glabrous, green; rootstock stout, with thick stringy roots; stems few, erect, 30-40 cm long, commonly dark violet, sparsely leafy; leaves sessile, united into short sheaths, lanceolate, elongate-acuminate, 4-7 cm long, 9-13 mm broad, 3-nerved, slightly scabrous-margined, the sheaths of lower leaves to 10 mm long, those of upper leaves much shorter; flowers in terminal clusters, enveloped in reduced terminal leaves; calyx campanulate, 15-18 mm long, half the length of corolla; calyx teeth 5-6 mm long, subequal, linear, acute, scaberulous-margined, half as long as the tube, the sinuses between the teeth obtuse; corolla tubular-clavate, ca. 35 mm long, ca. 10 mm across below the throat; corolla lobes ovate, obtusish, one sixth to one fifth the length of the tube; plaits half as long as the lobes, profusely fringed; stamens with distinct anthers and little dilated filaments; style short; capsule oblong, the stipe about as long as the capsule. July-August.

Meadow slopes in the middle mountain zone.—Soviet Central Asia: Dzu.-Tarb. Endemic. Described from Dzungarian Ala Tau, Borotala R. Type in Leningrad.

12. **G. septemfida** Pall. Fl. Ross. II (1788) 101; M.B. Fl. taur.-cauc. I, 195; Ldb. Fl. Ross. III, 67, p.p.; Boiss. Fl. or. IV, 74; Kuzn. Subgenus *Eugentiana*, 94; p.p.; Shmal'g. Fl. II, 213; Kuzn. in Mat. Kavk. IV, 317; Grossg. Fl. Kavk. III, 228.—*G. septemfida* α . genuina Kusn. Subg. *Eugentiana* (1904) 237, 240, p.p.—*C. fimbriae-plica* C. Koch in Linnaea, XXIII (1850) 584.—Ic.: Pall. Fl. Ross. II, tab. XCII, f. 3; Bot. Mag. XXX, tab. 1229; XXXIV, 1410; Gartenfl. XII, 551 tab. 406; XXVIII, 117.—Exs.: GRF, No. 1372; Pl. or. exs. No. 345; Fl. cauc. exs. No. 384.;

Perennial, glabrous, green; rootstock stout, with thick stringy roots; stems numerous, 15-40 cm long, ascending (f. *adscendens* Kusn.), rarely suberect, clothed below in brown scales, rather densely leafy; leaves sessile, sheathing, ovate, ovate-lanceolate or lanceolate, attenuate upward but obtusely tipped, 2-5 cm long, (6) 8-15 (20) mm broad, 5-nerved, the sheaths of lower leaves to 10-12 mm long, those of the upper ones much shorter; flowers crowded in compact many-flowered subcapitate terminal inflorescences, rarely solitary (f. *uniflora* Kusn.), or in twos or threes (f. *pauciflora* Kusn.), enveloped in smaller uppermost leaves; calyx campanulate, (10) 18-19 (26) mm long, half the length of the corolla; calyx teeth (4) 8-9 (19) mm long, as long as or somewhat shorter than tube, linear to linear-lanceolate, mostly less than 1 mm but sometimes to 3-4 mm broad, acute, narrowed toward base, minutely scabrous-margined, the sinuses between the teeth obtuse, the margin subtruncate;

corolla tubular-clavate, dark blue, (29) 40 (48) mm long, 15 (21) mm broad below the throat; corolla lobes ovate, obtusely acuminate, one seventh the length of tube; plaits half as long as the lobes, lacinate-fringed; stamens with distinct anthers and flat dilated filaments; style short; capsule oblong, ca. 23 mm long, narrowed at both ends, the stipe half as long as the capsule; seeds cylindric-fusiform, ca. 1.5 mm long, minutely alveolate, wingless. August-October.

Wood margins, meadows, gravelly and stony slopes, from the upper part of the timber zone to the alpine zone.—European part: Crim. (?); Caucasus: Cisc., W., E., and S. Transc., Dag., Tal. (rare). **Gen. distr.:** Bal.-As. Min. (Asia Minor), Arm.-Kurd. (?), Iran. (NW). Described from the alpine zone of E. Caucasus. Type in Leningrad.

13. **G. cordifolia** C. Koch in Linnaea, XXIII (1850) 585.—

G. septemfida β . *cordifolia* Boiss. Fl. or. (1879) 75; Kuzn. in Mat. Fl. Kavk. IV, 1, 324; Grossg. Fl. Kavk. III, 229.—*G. septemfida* β . *procumbens* f. *latifolia* Kusn. Subg. Eugentiana (1904) 240, p.p.—Ic.: Bot. Mag. CVI (1880) tab. 6497.

Perennial, glabrous, dark green; rootstock stout, with stringy roots; stems 10-15 cm long, numerous from common rootstock, ascending, curved; leaves coriaceous, rather crowded, not sheathing, the lowest 1 or 2 pairs smaller, 6-8 mm long, the others 15-20 mm long, 10-13 mm broad, ovate-triangular, obtuse, more or less distinctly cordate at base, 5-nerved; flowers terminal, solitary or rarely 2 or 3, enveloped in approximate
552 narrower uppermost leaves; calyx a third to half the length of corolla, (10) 14-18 mm long, conical tubular; calyx teeth unequal, 6-10 mm long, linear, acute, straight, minutely scabrous-margined, the sinuses between the teeth obtuse; corolla infundibular-tubular, dark green 36-40 mm long, 14-17 mm broad below the throat; corolla lobes 1/8 to 1/7 the length of tube, 4-5 mm long, broadly ovate, mucronate; plaits half as long as the lobes, fringed with filiform laciniae; ovary stipitate, the stipe the length of ovary; style short; capsule lance-oblong; seeds 0.5 mm long, ovoid-lanceolate, acute, minutely tuberculate. August-September.

Meadows in the alpine zone.—Occurring not far from the border of S. Transcaucasia on Mt. Ashikh-Dad in former Kagyzmanskii District. **Gen. distr.:** Bal.-As. Min. (Asia Minor). Described from Pontic Range. Type in Berlin.

14. **G. Grossheimii** Doluch in Zam. po sist. i geogr. rast. Tbil. bot. inst. 14 (1948) 51.—*G. septemfida* γ . *procumbens* Boiss. Fl. or. IV (1879) 75; Kuzn. Podrod. [Subgenus] Eugentiana (1894) 97, p.p.; in Mat. Fl. Kavk. IV, 1, 326; Kusn. Subg. Eugentiana (1904) 97, p.p.; Grossg. Fl. Kavk. III, 222.—Ic.: Doluch. l.c. 52.

Perennial, glabrous, green; rootstock rather stout, fairly short, with fibrous roots; stems 8-10 cm long, procumbent or ascending; leaves subcoriaceous, dark green, crowded and imbricated, the lower smaller, 3-5 mm long, 2-3 mm broad, triangular-ovate to suborbicular, the middle and upper large, 8-12 mm long, 3-6 mm broad, triangular-lanceolate, acute or subacute, not united, with a distinct midrib and faint lateral veins; flowers terminal, solitary or rarely in twos or threes; calyx half the length of corolla, (17) 20 (24) mm long, with conical tube; calyx teeth as long as

or slightly longer than tube, (7) 10 (12) mm long, unequal, narrowly linear-lanceolate, acute, minutely scabrous-margined, the sinuses between the teeth obtuse, the margin subtruncate; corolla tubular-infundibular, pale yellowish-blue with dark blue lobe margins, (36) 38 (41) mm long, 13-17 mm broad below the throat; corolla lobes ca. 8 mm long, about a quarter the length of tube, triangular from ovate base, acute; plaits fringed with numerous filiform laciniae, half as long as the lobes; ovary stipitate, the stipe about the length of ovary; capsule lance-oblong; seeds 0.5 mm long, ovoid, acute, very minutely tuberculate. July-August.

Crevices of calcareous rocks, in the middle and subalpine zones.—Caucasus: Dag. Endemic. Described from Gunib. Type in Tbilisi.

15. **G. Kolakovskiyi** Doluch. in Zam. po sist. i geogr. rast. Tbil. bot. inst. 14 (1948) 54.—*G. septemfida* var. *diversifolia* Albov, Prodr. fl. Colch. (1894) 163; Kuzn. in Mat. Fl. Kavk. IV, 1, 325; Grossg. Fl. 553 Kavk. III, 229.—*G. paradoxa* var. *latifolia* Albov, l.c. 175.—Ic.: Doluch. l.c. 55.

Perennial, glabrous, green; rootstock stout, with thick stringy roots; stems numerous, 15-25 cm, sometimes up to 40 cm long (f. *latifolia* (Alb.) Grossh.), erect or ascending; leaves sessile, short-sheathing, the lowermost rounded-ovate or suborbicular, ca. 10 mm long, 9 mm broad, the middle cauline leaves ovate-lanceolate, obtuse, 3-nerved, ca. 20 mm long, 7-8 mm broad, or rarely in threes and up to 25 mm long (f. *latifolia* (Alb.) Grossh.), the uppermost crowded below the flowers, narrowly lanceolate, ca. 20 mm long and 3-4 mm or rarely ca. 30 mm long (var. *bzybica* A. Doluch.), very rarely to 40-45 mm long (f. *latifolia* (Alb.) Grossh.); flowers terminal, solitary; calyx campanulate, (15) 19 (25) mm long, half the length of corolla; calyx teeth (7) 10 (15) mm long, equaling the tube or rarely longer (f. *latifolia* (Alb.) Grossh.), linear to linear-lanceolate, ca. 1 mm broad, acute, slightly narrowed toward base, smooth-margined, the sinuses between the teeth obtuse; corolla narrowly tubular-clavate, rich blue, (34) 40 (50) mm long, ca. 10 mm broad below the throat; corolla lobes ovate, acute or subacute, a quarter to one third the length of tube; plaits a quarter to one third as long as the lobes, fringed with numerous slender laciniae; stamens with distinct anthers and slightly dilated filaments; style short; capsule oblong, stipitate, the stipe half the length of capsule. July-August.

Meadows, gravelly slopes, in the middle and subalpine zones. Caucasus: W. Transc. Endemic. Described from Mt. Okum in Samurzakani. Type in Tbilisi.

16. **G. lagodechiana** (Kusn.) Grossh., Fl. Kavk. III (1932) 228; Dolukh. in Zam. po sist. i geogr. rast. Tbil. Bot. inst. 14, 51.—*G. septemfida* var. *lagodechiana* Kusn. in Mat. Fl. Kavk. IV, 1 (1903) 325.—Ic.: Gard. Chron. ser. III, LVI (1914), 232.

Perennial, glabrous, pale green; rootstock short, with numerous stringy roots; stems 20-40 cm long, slender, weak, flexuous, commonly pendulous, numerous, unbranched or slightly branched; leaves thin, the lower small, 5-16 mm long, 4-12 mm broad, broadly ovate to rounded-ovate, obtuse, sessile and slightly united, the middle and upper ones 1.5-3 cm long, 8-14 mm broad, ovate or ovate-oblong to sub lanceolate, attenuate upward

but obtuse, not united, 2-5-nerved, the uppermost quite close to and covering the flower; flowers solitary, terminal, rarely 2 or 3, distant; calyx (20) 21 (25) mm long, half to two thirds the length of corolla, the tube conical, the teeth half as long as the tube, (10) 14 (16) mm long, (2.5) 3.8 (6) mm broad, herbaceous, unequal, lanceolate, oblong or subelliptic, attenuate upward, acute, slightly scabrous-margined, the sinuses between the teeth acute; corolla tubular-funnelform, azure-blue, (33) 47 mm long, 8-16 mm broad below the throat; corolla lobes (7) 8 (9) mm long, one fifth the length of tube, in upper part triangular, acute; plaits half as long as the lobes, dissected into numerous filiform laciniae; ovary on a stipe about its own length. July -September.

Crevices among mostly damp rocks, in the lower and middle mountain zones. — Caucasus: E. Transc. (S. slopes of Greater Caucasus in Kakhetia and Azerbaijan), Dag. Endemic. Described from Lagodekhi Gorge. Type in Leningrad.

Series 5. **Paradoxae** Grossh. — Seeds wingless; corolla plaits long-fringed; leaves verticillate, narrowly linear; flowers yellowish.

17. **G. paradoxa** Albov. in Bull. herb. Boiss. III (1894) 230. — Kuzn. Podrod. Eugentiana (1894) 241; Al'bov, Prodr. Fl. Colch. 173; Kuzn. in Mat. Fl. Kavk. IV, 1, 314; Kusn. Subg. Eugentiana, 241; Grossg. Fl. Kavk. IV, 1, 314; Grossg. Fl. Kavk. III, 228. — Ic.: Bull. herb. Boiss. III, tab. 5; Al'bov, l.c. tab. 2.

Perennial, green, glabrous; rootstock short, cylindric, vertical, stout, many-headed; stems numerous, erect, unbranched, slender, 15-35 cm long, clothed at base in few brown scales, densely leafy elsewhere; leaves verticillate, with whorls of 4 or 5, lower leaves 2-4 mm long, upper leaves considerably shorter, sheathing, the lower sheaths 15-20 mm apart, the upper approximate, 2-10 mm apart; all leaves narrowly linear, single-nerved, the lower 8-15 mm long and 2.5-3 mm broad, the middle 15-30 mm long and 2 mm broad, the uppermost 30-40 mm long and 1.5 mm broad; flowers solitary, terminal, involucrate; calyx short-campanulate, (24) 30-32 (42) mm long, about half the length of corolla; corolla teeth narrowly linear, acute, (16) 20-22 (35) mm long, ca. 1 mm broad, twice the length of corolla or longer, the sinuses between the segments broad, obtuse, the margin subtruncate; corolla narrowly infundibular, brownish-green outside, yellowish and green spotted inside, with pale azure plaits and lobe margins, (49) 50-56 (60) mm long, 15-18 mm broad below the throat; corolla lobes ovate, triangular-tipped, acute, 10-16 mm long, a quarter the length of tube; plaits fringed, one third to half as long as the lobes; ovary sessile, the style a quarter to one third the length of ovary; capsule oblong-lanceolate, half as long as corolla; seeds 1.5-2 mm long, wingless, ovoid-lanceolate, beaked, brown, very minutely alveolate. August-September.

Calcareous rocks from the lower to the subalpine mountain zone (500-555 1500 m). — Caucasus: Cisc. (on Malaya Laba R.), W. Transc. (Abkhazai). Described from Mt. Mamdzyshka. Type in Geneva; cotype in Tbilisi.

Series 6. **Gelidae** Grossh. — Seeds winged; corolla plaits toothed; flowers yellow.

18. **G. gelida** M.B. Fl. taur.-cauc. I (1808) 196; III (1819) 188; Ldb. Fl. Ross. III, 68; Boiss. Fl. or. IV, 75; Kuzn. Podrod Eugentiana, 97; in Mat. Fl. Kavk. IV, 1, 328; Kusn. Subg. Eugentiana, 242; Grossg. Fl. Kavk. III, 228.—Ic.: Paxt. Mag. VII (1840) 5; Journ. Hort. ser. III, IV 537; Béguin. et Dir. Contrib. Fl. Armen. (1912) tab. 2.—Exs.: Pl. or. exs. No. 43.

Perennial, glabrous; green; rootstock fairly stout, with stringy roots; stems ascending, 15-40 cm long, numerous, unbranched, densely leafy; leaves subcoriaceous, the lowest small but relatively broad, ovate or elliptic, the middle and upper ones lanceolate or narrowly lanceolate, attenuate upward but obtuse, 3-nerved, 1.6-3 cm long, 4-6 (9) mm broad, sessile, with smooth revolute margins, united into sheaths 5-10 mm long; flowers 4-8 crowded at the end of stem, rarely solitary, enveloped in narrowly linear-lanceolate small uppermost leaves; calyx campanulate, (16) 20-22 (27) mm long, two thirds the length of corolla, sometimes split on one side; calyx teeth (6) 9-10 (17) mm long, about as long as the tube, narrowly linear, acute, narrowed toward apex and toward base, scaberulous-margined, the sinuses between the teeth obtuse, the margin subtruncate; corolla clavate-tubular, yellow, (30) 36-37 (41) mm long, 15-16 mm broad below the throat; corolla lobes 4-6 (11) mm long, 1/7 the length of tube, triangular-tipped, acute or subacute; plaits a quarter to one third as long as the lobes, asymmetrical, sharply triangular, biparted, sometimes entire or toothed; style short; capsule ovaloid-oblong, narrowed toward top and toward base, on a stipe half its own length; seeds cylindric, ovoid, 1.5-2 mm long, broadly winged throughout. August-October (Plate XXVIII, Figure 2).

Wood margins, scrub, and dry meadows, from the middle to the subalpine zone.—Caucasus: E. and S. Transc. **Gen. distr.:** Bal.-As. Min. (Asia Minor), Arm.-Kurd, (?), Iran (?). Described from the Caucasus. Type in Leningrad.

Series 7. **Kusnezovianae** Grossh. in Dokl. AN Azerb. SSR, III, 3 (1947) 116.—Flowers 4-merous, small, sessile; corolla plaits toothed.

19. **G. Overinii** (Kusn.) Grossh. in Dokl. AN Azerb. SSR, III, 3 (1947) 114.—**G. cruciata** Kusn. in Mat. Fl. Kavk. IV, 1 (1903) 332; Grossh. Fl. Kavk. III, 227.—Ic.: Dokl. AN Azerb. SSR, III, 3, 115.

Perennial, glabrous, green; stems ascending, 15-30 cm long, unbranched, densely leafy; leaves subcoriaceous, the lowermost small, 6-8 mm long, broadly oval, the middle and upper ovate to ovate-lanceolate, attenuate upward, acute, 2-4 cm long, 8-15 mm broad, 3-nerved, smooth-margined, sessile, united into sheaths 3-8 mm long; flowers 4-8 crowded at the end of stem, enveloped in ovate-lanceolate uppermost leaves, these not overtopping the flowers; calyx campanulate, unsplitting, 18-21 mm long, two-thirds the length of corolla; calyx teeth four, 8-11 mm long, longer than the tube, narrowly linear, acute, narrowed toward apex and toward base, scaberulous-margined, the sinuses between the teeth obtuse, the margin subtruncate; corolla conical-campanulate, intensely bluish-violet, 28-30 mm long, 8-10 mm broad below the throat; corolla lobes four, 6 mm long, a quarter the length of tube, triangular-tipped, acute, the margin smooth or minutely denticulate; plaits a quarter to one third as long as the

lobes, sharply triangular, coarsely dentate at apex; style short; ovary elongate-oblong. July.

Meadows and precipitous slopes in the upper mountain zone. Caucasus: Dag. Endemic. Described from the area above the village of Danukh. Type in Leningrad.

Section 3. **FRIGIDA** Kusn. in Tr. Bot. Sada, XIII, 4 (1893) 61.—

Perennials, rarely annuals; leaves hyaline-margined, the lower rosulate; corolla large, limbless, with erect lobes; plaits asymmetrical; capsule long-stalked; seeds white-squamaceous, the scale forming a hexagonally alveolate pattern.

1. Corolla 18-20 mm long, uniformly blue or dark blue 23. *G. glauca* Pall.
- + Corolla 30-50 mm long, light-colored, profusely dotted or spotted with dark violet 2.
2. Corolla 30-32 mm long, whitish-green, profusely violet-dotted 22. *G. frigida* Haenke.
- 559 + Corolla 40-50 mm long, whitish-green golden, rather densely and minutely violet-dotted 3.
3. Plants 20-25 cm tall; flowers 2-5, terminal 20. *G. algida* Pall.
- + Plants 4-6 cm tall; flowers solitary, rarely in pairs 21. *G. Romanzovii* Ldb.

Series 1. **Frigidae** Grossh.—Corolla whitish, with violet dots and spots.

20. *G. algida* Pall. Fl. Ross. II (1788) 107; Kom. Fl. Kamch. III, 33; Kryl. Fl. Zap. Sib. IX, 2183.—*G. algida* α . *sibirica* Turcz. in Vestn. estestv. nauk (1860) 1355; Kuzn. Podrod Eugentiana, 114; Kusn. Subg. Eugentiana, 259; Kom. Fl. Kamch. III, 34.—*G. frigida* γ . *algida* Ldb. Fl. Ross. III (1847-1851) 65.—Ic.: Pall. Fl. Ross. II, tab. XCV; Gartenfl. XXIX, 1006.—Exs.: GRF, No. 1377, a, b.

Perennial, glabrous; pale green; rootstock short, vertical, with thin stringy roots; lowermost cauline leaves vested with hairy leaf remnants; stems erect, (10) 20-25 (35) cm long, solitary or numerous; most leaves basal, oblong-spatulate to linear-spatulate, 7-15 cm long, 4-8 (to 15) mm broad, thinly membranous, smooth or rarely scaberulous-margined; cauline leaves few, linear, obtuse, united into sheaths to 15 mm long;; flowers 2-5 crowded at the top of stem, rarely solitary, involucrate; calyx campanulate, (14) 20 (30) mm long, one third to half the length of corolla, sometimes split on one side; calyx teeth (4) 7-10 (15) mm long, linear, unequal, obtusish, mostly smooth-margined, the sinuses between the teeth obtuse and narrow; corolla tubular-clavate, golden with whitish-green tint, rather densely and minutely violet-dotted, in upper part diffusely violet-spotted, (41) 45-50 (55) mm long, 12-15 (22) mm broad below the throat; corolla lobes triangular to triangular-ovate, acute, (3) 4-5 (7) mm long, 1/10 to 1/8 the length of tube; plaits asymmetrical, triangular, short, subtruncate; stamens distinct; ovary long-stalked; style short; capsule ovoid-oblong; seeds ellipsoid, 0.5 mm long, alveolate. July-August.



Plate XXIX

1. *Gentiana Olgae* Rgl. et Schmalh.—2. *G. Walujewii* Rgl. et Schmalh.—3. *G. macrophylla* Pall.

Meadows, peat bogs, moss- and lichen-covered rocks, and swampy places, up to the upper mountain zone.— W. Siberia: Ob, Alt.; E. Siberia: Lena-Kol., Ang.-Say., Dau.; Soviet Central Asia: Dzu.-Tarb., T. Sh.
Gen. distr.: Dzu.-Kash., Japan. Described from the mountains of E. Siberia. Type in Leningrad.

21. **G. Romanzovii** Ldb. ex Bge. in Mem. Soc. Nat. Mosc. I (VII) (1829)
560 25.— *G. frigida* β . *Romanzowii* Ldb. Fl. Ross. III (1847-1851) 65.—
G. algida β . *Romanzowii* Kusn. Podrod Eugentiana (1894) 119; Subg. Eugentiana, 265; Kom. Fl. Kamch. III, 34.— Ic.: Mem. Soc. Nat. Mosc. I (VII), tab. XI, f. 1; Amer. Bot. XXV, 41.

Perennial, glabrous, pale green; stems 2-10 mm long, the entire plant 4-6 cm tall; rootstock slender, vertical, with thin stringy roots; stem base enveloped in sheaths of old leaves; leaves rosulate, linear-spatulate, often falcately curved, 2-4 cm long, 5-7 mm broad, smooth-margined; flowers solitary, rarely 2 at the top of stem; calyx short-campanulate, 15-20 mm long, one third to half the length of corolla, rarely split on one side; calyx teeth unequal, 4-8 mm long, linear, acutish, or obtusish, often reflexed, the sinuses between the teeth obtuse and narrow; corolla tubular-clavate, golden with a whitish-green tint, profusely and minutely violet-dotted, dark violet-spotted below the lobe, 30-40 (45) mm long, 12-18 mm broad below the throat; corolla lobes triangular, acute or subacute, 3-5 mm long, 1/10 to 1/8 the length of tube; plaits short, irregularly triangular; ovary short-stipitate; capsule oblong-ovoid; seeds ellipsoid, lepidote-alveolate. July-August.

Meadows, swamps, peat bogs, and mossy places.— Arc.: Chuk., An.; Far East: Kamch., Okh. **Gen. distr.:** N. America. Described from St. Lawrence Island. Type in Leningrad.

22. **G. frigida** Haenke in Jacq. Coll. 2 (1788) 13, No. 6.— *G. frigida* α . genuina Ldb. Fl. Ross. III (1847-1851) 65.— *G. algida* γ . *frigida* Kusn. Podrod Eugentiana (1894) 120; Kusn. Subg. Eugentiana, 264.— Ic.: Froel. Gentian. (1796) 39; Rchb. Ic. Fl. Germ. XVII, tab. 1050.

- Perennial, glabrous, green; rootstock short, vertical, with thin stringy roots; stems with 1 or 2 internodes, 1-2 (5) cm long, often ascending; plants 4-6 (10) cm tall; stem base enveloped in old leaf sheaths; basal leaves numerous, linear-spatulate, 2-4 (6) cm long, 4-8 mm broad; cauline leaves sheathing, oblong-lanceolate to lance-linear, obtuse, the sheaths of lower leaves to 15 mm long; flowers solitary or 2 at the top of stem; calyx campanulate, 12-20 mm long, slightly split; calyx teeth broadly linear, sometimes triangular-lanceolate, obtuse or subacute, unequal, as long as or longer than the tube; corolla tubular-clavate, whitish-greenish, with numerous violet dots and diffuse dark violet spots below the lobes, (26) 30-32 (35) mm long, 12-15 mm broad below the throat; corolla lobes
561 broadly ovate, obtuse, 2-3 mm long, 1/12-1/10 the length of tube; plaits very short, obliquely triangular, sometimes more or less toothed; stamens distinct; ovary long-stipitate; style short; capsule oblong-ovoid; seeds ovaloid, 1-1.5 mm long, alveolately squamaceous. July-August.

Stony slopes in the alpine zone.— European part: U. Dns. (Carpathians). **Gen. distr.:** Centr. Europe. Described from Styria. Type in Vienna.

Series 2. **Glaucæ** Grossh. — Corolla unicolor, dark blue.

23. **G. glauca** Pall. Fl. Ross. II (1788) 104; Ldb. Fl. Ross. III, 66; Kuzn. Podrod. Eugentiana, 134; Kusn. Subg. Eugentiana, 279; Kom. Fl. Kamch. III, 32. — Ic.: Pall. Fl. Ross. II, tab. XCIII, f. 2, A, B; Hook. Fl. bor.-am. tab. 147.

Perennial, glabrous, pale green; stems 5-15 (20) cm long, erect, rarely ascending; lower leaves rosulate, numerous, obovate-spatulate, 10-20 mm long, 6-10 mm broad, smooth-margined; cauline leaves distant, short-sheathing, elliptic to elliptic-orbicular, 8-16 mm long, 7-10 mm broad; flowers 2-5, crowded at the top of stem; calyx short-campanulate, unsplit, 6-9 mm long; calyx teeth unequal, triangular, acute, 2-4 mm long, the sinuses between the teeth acute; corolla triangular-clavate, blue or dark blue, 18-20 mm long; corolla lobes oval, obtuse, 2 mm long, 1/10-1/8 the length of tube; plaits very short, asymmetrical, minutely auriculate on one side; stamens distinct, the filaments scarcely dilated; ovary long-stipitate; style very short; capsule long-stipitate, ovaloid, obtuse, beakless, overtopping by one third the persistent corolla; seeds ca. 1 mm long, squamaceous-alveolate. July-August.

Tundra, in grass plots among rocks and in meadows. — Arc.: Chuk., An.; E. Siberia: Dau. (?); Far East: Kamch., Okh. **Gen. distr.:** N. America. Described from Kamchatka. Type in Leningrad.

Section 4. **APTERA** Kusn. in Tr. Bot. Sada, XIII, 4 (1893) 62. — Perennials; crown enveloped in fibrillose sheaths of old leaves; lower leaves rosulate; corolla limbless or obscurely limbed; plaits large, commonly symmetrical, biparted; seeds oblong, flattened, wingless, finely reticulate or smooth.

1. Ovary sessile 2.
- + Ovary distinctly stipitate 6.
2. All stem internodes about equal, shorter than the leaves. 3.
- + Internodes unequal, the lower and middle ones longer, the upper short. 4.
- 562 3. Calyx 6-8 mm long; corolla 20-23 mm long, 3-5 times the length of calyx 32. **G. cruciata** L.
- + Calyx 15-16 mm long; corolla ca. 25 mm long, twice the length of calyx ***G. phlogifolia** Schott et Kotschy.
4. Calyx much shorter than corolla, unsplit or split, with short teeth. 31. **G. macrophylla** Pall.
- + Calyx half the length of corolla 5.
5. Calyx unsplit, with 5 linear teeth 29. **G. dahurica** Fisch.
- + Calyx longitudinally split in two, with 3 short subulate teeth 30. **G. Fetissowi** Rgl. et Winkl.
6. Sinuses between the teeth acute; corolla infundibular 33. **G. Olivieri** Griseb.
- + Sinuses between the teeth obtuse 7.
7. Corolla (35) 40-50 (55) mm long, blue; calyx tubular-campanulate, unsplit 28. **G. Kaufmanniana** Rgl. et Schmalh.
- + Corolla 30-35 mm long 8.
8. Flowers blue 9.

- + Flowers yellow10.
- 9. Calyx 14-16 mm long, unsplit or split, the linear obtuse teeth
5-7 (8) mm long; corolla narrow, tubular-infundibular, ca. 30 mm
long25. *G. tianschanica* Rupr
- + Calyx 10-14 mm long, always split on one side to the middle or lower
down, the 2-5 teeth ca. 1 mm long; corolla campanulate-infundibular,
30-35 mm long24. *G. decumbens* L.
- 10. Calyx teeth subulate or narrowly linear, 3-4 or 5-7 mm long; corolla
30-35 mm long, 7-10 (12) mm broad at the throat
.....26. *G. Olga* Rgl. et Schmalh.
- + Calyx teeth oblanceolate-linear, acuminate, 6-8 mm long; corolla
25-30 mm long, 5-7 mm broad at the throat
.....27. *G. Walujewii* Rgl. et Schmalh.

Series 1. **Decumbentes** Grossh. — Ovary distinctly stipitate; calyx split; corolla small, narrowly tubular-infundibular, blue or yellow.

24. *G. decumbens* L. f. Suppl. (1781) 174; Ldb. Fl. Ross. III, 64; Kuzn. Podrod Eugentiana, 151; Kusn. Subg. Eugentiana, 295; Fedch. Rast. Turk. 648. — *G. adscendens* Pall. Fl. Ross. II (1788) 106. — *G. Gebleri* Ldb. ex Bge. in Mem. Soc. Nat. Mosc. I (VII) (1829) 211, tab. 8. —
563 *G. decumbens* var. *Pallasii*, var. *Gebleri* Kryl. Fl. Zap. Sib. IX (1937) 2186. — Ic.: Pall. Fl. Ross. II, tab. XLIV; Basn. Ind. Med. Pl. (1818) tab. 639; Gartenfl. XXXI, tab. 1087.

Perennial, glabrous, green; rootstock stout, branched, with coarse stringy roots; stems (5) 15-30 cm long, densely enveloped in lower part to 4 cm in fibrillose sheaths of old leaves, coarse, ascending to suberect; leaves mostly at stem base, numerous, long-sheathing, linear-lanceolate, (5) 8-15 (20) cm long, 6-15 (22) mm broad, glabrous or slightly scabrous on the margin; cauline leaves 2 (3) pairs, long-sheathing, linear, much shorter and narrower than the lower leaves; flowers sessile or short-pediceled, clustered in the axils of uppermost leaves in a dense terminal head; calyx 10-14 mm long, membranous, split on one side to the middle or nearly down to base; calyx teeth 2-5, subulate, ca. 1 mm long (var. *Pallasii*), rarely somewhat longer or wanting (var. *Gebleri*); corolla campanulate-infundibular, split at the top, dark blue, (22) 30-35 (40) mm long, 12-13 mm broad below the throat; corolla lobes ovate, obtuse or obtusely rounded, 1/8-1/6 the length of tube; plaits asymmetrical, triangular, ca. 1 mm long; stamens distinct, with slightly dilated filaments; ovary stipitate; style short; capsule ovaloid; seeds wingless, minutely reticulate. July-August.

Grassy slopes, steppe meadows, and subalpine meadows. — European part: V.-Ka., Transv.; W. Siberia: Irt., Alt.; E. Siberia: all regions; Soviet Central Asia: Balkh., Dzu.-Tarb. **Gen. distr.:** Dzu.-Kash. Described from Siberia. Type in London.

25. *G. tianschanica* Rupr. in Mem. Acad. Sc. Petersb. VII ser. XIX, 4 (1869) 61. — *G. tianchanica* α . genuina, δ . intermedia, ϵ . glomerata et ζ . pumila Kusn. Subg. Eugentiana (1904) 300, 305, 308. — *G. Kirilowii* Turcz. in Vestn. estestv. nauk (1860) 1354 p.p.; Fedch. O. and B. Perech. rast. Turk. V, 20. — *G. Regelii* Kusn. in Mel. Biol.

XIII (1894) 177.— *G. Regelii* α . *genuina* f. *turkestanica*, ϵ . *glomerata*, ζ . *pumila* Kusn. *Podrod Eugentiana* (1894) 156.— *G. glomerata* Kusn. in *Mel. Biol.* XIII (1894) 177.— *Ic. : Bull. Acad. Sc. Petersb.* XXXIV (1892) 508, tab. 3, f. 10.— Kusn. in *Mel. biol.* XIII, 20-23, 24-27.

564 Perennial, glabrous, green; rootstock stout, short, with stringy roots; base of stems densely enveloped to 3-4 cm in fibrillose sheaths of old leaves; stems ascending, 20-40 cm long, sometimes merely 5-8 cm long (var. *pumila* Kusn.), glabrous; basal leaves numerous, linear-lanceolate, narrowed at both ends, 5-10 (to 20) cm long, 6-10 (to 25) cm broad, the margin smooth or scaberulous; cauline leaves distant, 3-5 pairs, sheathing to 10-20 mm, narrower and shorter than the basal; flowers in clusters on fairly long pedicels in the axils of uppermost leaves and at the top of stem, forming a loose inflorescence, or clusters subsessile (var. *glomerata* Kusn.); calyx commonly split on one side to the middle or unsplit (var. *glomerata* Kusn.), (12) 14-16 (18) mm long, half the length of corolla, the linear herbaceous obtuse teeth 5-7 (8) mm long; corolla narrowly tubular-infundibular, dark blue, (25) 30 (35) mm long; corolla lobes ovate, acutish, 1/10-1/8 the length of tube; plaits short, triangular, symmetrical, often biparted at top; stamens distinct, with dilated filaments; ovary stipitate; style short; capsule ellipsoid-lanceolate, narrowed at both ends. July-August.

Fescue steppes, gravelly and stony slopes, spruce forests, and meadows, in the middle and upper mountain zones.— Soviet Central Asia: Balkh., Dzu.-Tarb., T. Sh. **Gen. distr.:** Dzu.-Kash. Described from Tien Shan. Type in Leningrad.

26. **G. Olgae** Rgl. et Schmalh. in *Izv. Obshch. lyubit. estestvozn., antrop. i etnogr.* XXXIV, 2 (1882) 55; Kuzn. *Podrod Eugentiana*, 165; Kusn. *Subg. Eugentiana*, 309; Fedch., *Rast. Turk.* 648.— *G. Renardi* Rgl. in *Descr. pl. nov. auctor. a Trautv., Rgl., Maxim., Winkler, Petr.* (1882) 7; Kuzn. *Podrod Eugentiana*, 168; Kusn. *Subg. Eugentiana*, 312; Fedch. *Rast. Turk.*, 648.— *G. Grombaczewskii* Kusn. in *Mel. Biol.* XIII (1894) 337; Kuzn. *Podrod Eugentiana*, 167; Kusn. *Subg. Eugentiana*, 311; Fedch. *Rast. Turk.* 648.— *Ic. : Kusn. in Mel. Biol.* XIII, f. 56-58.

Perennial, glabrous, pale green; rootstock short, with thin stringy roots; stem base densely enveloped to 2-3 cm in fibrillose sheaths of old leaves; stems ascending, 10-20 (30) cm long; basal leaves numerous, linear-lanceolate, narrowed at both ends, (5) 8-13 (20) cm long, 8-10 (to 22) mm broad, 3-5-nerved, smooth-margined, shorter than but sometimes nearly as long as the stem; cauline leaves 2-3 pairs, with long sheaths and linear blade, much shorter and narrower than the basal; flowers sessile, in a dense terminal head (var. *Grombaczewskii* (Kusn.) *Ic.-Gal.*) or in a fairly loose terminal head or, in addition, with a few axillary lateral flowers; calyx 13-17 (20) mm long, one third to half the length of corolla, unsplit (var. *Renardi* (Rgl.) *Ic.-Gal.*) or more often split on one side to the middle; calyx teeth unequal, nearly subulate, 3-4 mm long (var. *Grombaczewskii*) or more often narrowly linear, 5-7 (to 11) mm long; corolla tubular-infundibular, pale yellow, sometimes dark violet-dotted in throat (var. *punctata* B. Fedtsch.) with faintly bluish lobes, 30-35 mm

long, 7-10 (12) mm broad below the throat; corolla lobes ovate-oblong, acutish, 4-6 mm long, 1/8 to 1/5 the length of tube; plaits symmetrically triangular, simple or biparted at the top, half as long or rarely nearly as long as the lobes; stamens distinct, with narrowly winged filaments; ovary and capsule long-stipitate; seeds reticulate. July-August (Plate XXIX, Figure 1).

Mixed grass and fescue steppes, gravelly slopes, juniper woods, and meadows, from foothills up to 3000 m. — Soviet Central Asia: Syr D., Pam.-Al., T.Sh. Endemic. Described from Sokh. Type in Leningrad.

27. **G. Walujewii** Rgl. et Schmalh. in Tr. Bot. Sada, VII (1880) 334; Kuzn., Podrod [Subgenus] Eugentiana 168; Kusn. Subg. Eugentiana 313; Fedch. Rast. Turk. 648. — **G. Kesselringi** Rgl. in Tr. Bot. Sada, VII (1881) 548-549. — **G. Waluewi** β . Kesselringi Kusn. Podrod Eugentiana (1894) 170; Kusn. Subg. Eugentiana, 314. — Ic.: Rgl. Gartenfl. XXXII, tab. 1087, f. 3-4.

Perennial, glabrous, green; rootstock strong, with stringy roots; stems ascending or erect, stout, (25) 30-40 (50) cm long; basal leaves numerous, lanceolate to broadly oblanceolate, 5-7 nerved, 15-20 (25) cm long, (15) 20-45 mm broad, slightly shorter than the stem, smooth-margined; cauline leaves 2 or 3 pairs, long-sheathing, lanceolate, 5-7 cm long, ca. 10-12 mm broad; flowers in a dense terminal head, sometimes also in few-flowered peduncled clusters in the axils of upper leaves; calyx 14-17 mm long, half the length of corolla; calyx teeth herbaceous, oblanceolate-linear, narrowed toward base, acuminate or rarely lanceolate toward apex and not narrowed toward base (var. *Kesselringi* (Rgl.) Kusn.), unequal, 6-8 mm long, as long as or slightly shorter than the tube; corolla tubular-infundibular, pale yellow, blue-dotted and sometimes blue-striped, (21) 25-30 (35) mm long, 5-7 mm broad below the throat; corolla lobes elliptic-lanceolate, acute, 4-5 mm long, 1/8 to 1/6 the length of tube; plaits lance-linear, simple or biparted, rarely toothed, half as long as the lobes; stamens distinct, with narrowly winged filaments; seeds compressed, reticulate, July-August (Plate XXIX, Figure 2).

Grassy slopes in the middle and upper mountain zones. — Soviet Central Asia: Dzu.-Tarb., **Gen. distr.**: Dzu.-Kash. Described from the town of Yultus in Kashgaria. Type in Leningrad.

Series 2. **Kaufmannianae** Grossh. — Ovary sessile or borne on a very short stipe; calyx unsplit; corolla large, blue, tubular-campanulate or tubular-infundibular.

28. **G. Kaufmanniana** Rgl. et Schmalh. in Tr. Bot. Sada, VII (1880) 331; Kuzn., Podrod Eugentiana [Subgenus Eugentiana] 172; Fedch., Rast. Turk. 649; Kusn. Subg. Eugentiana, 317.

566 Perennial, glabrous, apple-green; rootstock stout, with thick stringy roots; stems ascending, 10-20 (40) cm long; stem base densely enveloped to 1-2 cm in a fibrillose network; basal leaves numerous, oblong-lanceolate, 3-12 (15) cm long, 6-15 mm broad, strongly narrowed toward base, obtuse, 3-nerved, mostly shorter than the stem; cauline leaves 2-3 pairs, sheathing to 10-12 mm, abbreviated, lanceolate, the uppermost close to flower; flowers terminal, solitary or 2 or 3, rarely more; calyx 20-30 mm long, half the

length of corolla, tubular-campanulate, unsplit, obtusely truncate between the teeth; calyx teeth herbaceous, oblong-linear, obtusish, as long as or slightly longer than the tube; corolla tubular-infundibular, intensely dark blue, (35) 40-50 (55) mm long, 14-18 (22) mm broad below the throat; corolla lobes ovate, rounded-obtuse, 5-7 mm long, $1/10$ - $1/8$ the length of tube; plaits strongly asymmetrically triangular, broader than long, simple or biparted or toothed, much shorter than the lobes; stamens distinct, with narrowly winged filaments; ovary short-stipitate; capsule oblong, round-topped; seeds narrowly winged. July-August.

About the timberline, in subalpine and alpine meadows, moraines, and in alpine tundra.—W. Siberia: Alt., Soviet Central Asia: Dzu.-Tarb., Pam. Al., T. Sh. **Gen. distr.:** Ind.-Him., Dzu.-Kash. Described from the Dzilkarkar River in Tien Shan. Type in Leningrad.

29. **G. dahurica** Fisch. in Mem. Soc. Nat. Mosc. III (1812) 63; Kuzn. Podrod Eugentiana, 174; Kusn. Subg. Eugentiana, 318.—*G. decumbens* Ldb. Fl. Ross. III (1846-1851) 65.

Perennial, glabrous, green; rootstock stout; stems ascending to suberect, 25-40 cm tall, enveloped at base in fibrillose sheaths of dead leaves; most leaves basal, lance-linear, narrowed at both ends, 8-10 cm long, 10-12 mm broad, obtusish or acute, 3-nerved, scabrous-margined; cauline leaves 2-4 pairs, short-sheathing, the upper almost sheathless, 4-10 cm long; flowers 4-8, at the top of stem and in axils of upper leaves, on one stem axillary, on pedicels to 15 mm long; calyx membranous, tubular-campanulate, 13-17 mm long, half the length of corolla, regular; calyx teeth linear-subulate, unequal, the longer 6-7 mm, the shorter 3 mm long; corolla tubular-infundibular, intensely dark blue, 35-40 mm long, 12-14 mm broad below the throat; corolla lobes ovate-oblong, obtuse or acutish, 7-9 mm long, a quarter to one third the length of tube; stamens distinct, with narrowly winged filaments; ovary sessile, with short stigma; capsule sessile, oblong; seeds lustrous, wingless. July-August.

567 Grassy slopes.—E. Siberia: Ang.-Say., Dau. **Gen. distr.:** Mong., Tib. Described from Siberia. Type in Leningrad.

Series 3. **Cruciatae** Grossh.—Ovary sessile; calyx unsplit, rarely split; flowers 4-merous, rarely 5-merous, small.

30. **G. Fetissowii** Rgl. et Winkl. in Tr. Bot. Sada, VII (1880) 548; Kuzn., Podrod Eugentiana [Subgenus Eugentiana] 179; Kusn. Subg. Eugentiana, 324.

Perennial, glabrous, pale green; rootstock stout, with stringy roots; stems erect, coarse, to 6 mm in diameter in lower part, 40-60 cm long; stem base enveloped to 2-5 cm in fibrillose sheaths of old leaves; nearly all leaves basal, the lowermost with short ovate blade, the middle large, lanceolate or narrowly lanceolate, narrowed at both ends, 10-20 (to 40) cm long, 15-25 (to 40) mm broad, shorter than the stem; cauline leaves 4 or 5 pairs, narrowly lanceolate, abbreviated; flowers sessile, crowded in compact heads at the top of stem and in the axils of upper leaves; calyx thinly membranous, commonly whitish, 10-12 (14) mm long, half the length of corolla, commonly split on one side to the middle; calyx teeth subulate-triangular, acute, mostly 3 or rarely 5, much shorter than the tube; corolla oblong, tubular-campanulate, intensely dark blue, 20-25 (28) mm long,

6-7 mm broad below the throat; corolla lobes triangular, commonly acute, rarely obtusish, 3-4 mm long, 1/8 to 1/6 the length of tube; plaits very short, ca. 1 (2) mm long, obtusish, asymmetrical; stamens distinct, the filaments not dilated; ovary sessile; capsule oblong, acute; seeds minutely reticulate, wingless. July-August.

Meadows, stony steppes, and near brooks, up to the alpine zone.— W. Siberia: Irt., Alt.; Soviet Central Asia: Balkh., Dzu.-Tarb. **Gen. distr.:** Dzu.-Kash., Tib. Described from the town of Malye Yultus in Kashgaria. Type in Leningrad.

31. **G. macrophylla** Pall. Fl. Ross. II (1788) 108; Ldb. Fl. Ross. III (1847-1851) 69; Kuzn. Podrod Eugentiana, 181; Kusn. Subg. Eugentiana, 326; Kom. et Alis. Opred. rast. Dal'nevost. kr. II, 860; Kryl. Fl. Zap. Sib. IX, 2185.— *G. macrophylla* β . *minor* Ldb. Fl. Ross. III (1847-1851) 70.— *G. jakutensis* Bge. in DC. Prodr. IX (1845) 118.— *lc.*:— Pall. Fl. Ross. II (1788) tab. XLVI.

568 Perennial, glabrous, pale green; rootstock stout; stems erect or slightly ascending, coarse, 3-6 mm in diameter, 40-70 cm long; stem base densely enveloped to 2-8 cm in fibrillose sheaths of old leaves, the internodes very unequal; most leaves basal, the lowermost with small blade, the others very large, up to 40 cm long, though mostly not exceeding 20 cm in length, 18-30 (45) mm broad, elongate-lanceolate, acute, subpetiolate, 3-5-nerved; cauline leaves 3 or 4 pairs, much shorter and narrower, 6-10 (14) cm long, 6-10 (25) mm broad, narrowly oblong, acutish, the uppermost 4-6 still shorter, crowded below and enveloping but not overtopping the inflorescence; flowers crowded in dense many-flowered heads in the axils of the approximate upper leaves, rarely flower whorls subdistant; calyx thinly membranous, whitish, ca. 6 mm long, half the length of corolla, commonly split on one side to the middle or lower down; calyx teeth obsolescent or very short, triangular, acute, many times shorter than the tube; corolla 5-parted, tubular-campanulate, intensely bluish-violet, 16-20 mm long, ca. 5 mm broad below the throat; corolla lobes triangular, acute, ca. 2 mm long, 1/8 to 1/6 the length of tube; plaits very short, not exceeding about 1 mm, symmetrical; stamens distinct, with dilated filaments; ovary sessile; capsule oblong, acute; seeds brown, lustrous, wingless. July-August (Plate XXIX, Figure 3).

Steppes, and glades in light woods.— W. Siberia: Irt., Alt.; E. Siberia: all regions; Far East: Ze.-Bu., Uss. **Gen. distr.:** Mongolia, China. Described from Siberia. Type in Leningrad.

32. **G. cruciata** L. Sp. pl. (1753) 231; M.B. Fl. taur.-cauc. I, 196; Ldb. Fl. Ross. III, 69; Boiss. Fl. or. II, 76; Kuzn. Podrod Eugentiana, 184; Shmal'g. Fl. II, 212; Kuzn. in Mat. Fl. Kavk. IV, 1, 330; Kusn. Subg. Eugentiana, 329; Grossg. Fl. Kavk. III, 227; Fl. Yugo-Vost. II, 48; Kryl. Fl. Zap. Sib. IX, 2184; Maevsk. Fl. ed. 7, 578.— *lc.*— Jacquin, Austr. tab. 372; Rchb. Ic. Fl. Germ. XVII, tab. 1052.— Exs.: GRF, No. 981.

Perennial, glabrous, pale green; rootstock stout; stems erect or slightly ascending, coarse, 2-3 mm in diameter, 20-50 (70) cm long, enveloped at base in fibrillose sheaths of old leaves; rosulate leaves 5-8, oboval-lanceolate or subelliptic, narrowed toward base, 3-5-nerved, 3-8 cm long,

15-25 mm broad; cauline leaves numerous (up to 8-10 pairs), fairly close together, ovate-lanceolate, narrowed toward apex, subacute, 3-nerved, 4-8 cm long, 12-20 mm broad, scaberulous-margined, united in pairs into sheaths to 10-30 (45) mm long; flowers in clusters in the axils of upper leaves, forming 4-6 dense verticels; calyx thinly membranous, whitish, 6-8 mm long, a quarter to one-third the length of corolla, unsplit, the 4 triangular acute teeth 1-2 mm long or rarely longer; corolla 4-angled, blue, 20-35 mm long, 5-6 mm broad below the throat; corolla lobes oval-triangular, acute or subacute, one sixth to a quarter the length of tube; 569 plaits one third to half as long as the lobes, triangular, biparted at the top; ovary sessile; stamens distinct, with slender filaments; capsule oblong; seeds oblong-cylindric, ca. 1 mm long, brown, lustrous, finely oblongly-reticulate. July-August.

Wood margins, glades, scrub, meadows, and dry grassy slopes, from lowlands to the subalpine zone.—European part: Balt., Dv.-Pech., Lad.-Ilm., U.V., V.-Ka., U. Dnp., M. Dnp., V.-Don, Transv., Bl., Bes., Crim.; Caucasus: Cisc., Dag., W., E., and S. Transc., Tal.; W. Siberia: Ob, U. Tob., Irt.; Soviet Central Asia: Ar.-Casp. (N.). **Gen. distr.:** Centr. and Atl. Eur., W. Med., Bal.-As. Min. Described from Pannonia.* Type in London.

***G. phlogifolia** Schott et Kotschy in Bot, Zeit. (1850) 151.—

G. cruciata β . *phlogifolia* and γ . *depressa* Kuzn. Podrod Eugentiana (1894) 189, 190; Kusn. Subg. Eugentiana, 332, 333.—

G. depressa Schur, Sertum, No. 1886 (1853).—Ic.: Javorka, Flora Hungar. f. 2724.

Perennial, glabrous, pale green; rootstock stout; stems ascending, 10-16 cm long, 2-3 mm in diameter, enveloped at base in fibrillose sheaths of dead leaves; basal leaves 6-10, lance-oblong, narrowed at base into a distinct petiole, 4-11 cm long, 10-14 mm broad, 3-nerved or faintly 5-nerved; cauline leaves 7-12 subapproximate pairs, 2.5-4.5 cm long, 6-9 mm broad; flowers in a terminal cluster and sometimes also in the axils of upper leaves, few; calyx membranous, 15-16 mm long, half the length of corolla, often split on one side to the middle or lower down; calyx teeth 4, narrowly linear, ca. 6 mm long, half the length of tube; corolla 4-parted, tubular-clavate, intensely bluish-violet, ca. 25 mm long, 6-7 mm broad below the throat; corolla lobes oval-orbicular, acutish, ca. 4 mm long, one fifth the length of the tube; plaits ovate, one third to half as long as the lobes; ovary sessile, oblong; stamens with slender filaments; capsule oblong; seeds oblong-cylindric, ca. 1 mm long, brown, finely oblongly reticulate, wingless. July.

Meadows, among calcareous rocks, in the alpine zone. May be found in the Carpathians. **Gen. distr.:** Centr. Eur. (Transylvania). Described from Transylvania.

Series 4. **Olivierianae** Grossh.—Flowers 5-merous; ovary stipitate; calyx unsplit, the sinuses between the teeth acute; corolla infundibular to subobconical; seeds wingless.

* [Includes parts of modern Austria, Hungary and Yugoslavia.]

33. **G. Olivieri** Griseb. *Gent.* (1839) 278 et in DC. *Prodr.* IX, 110; Boiss. *Fl. or.* IV, 76; Kuzn. *Podrod Eugentiana* 190; Kuzn. in *Mat. Fl.* 570 *Kavk.* IV, 1, 333; Kusn. *Subg. Eugentiana*, 334; Fedch. *Rast. Turk.* 649.—*G. dahurica* Kar. et Kir. *Enum. pl. songor.* (1841) 133, non Fisch.—*G. Weschniakowii* Rgl. in *Tr. Bot. Sada*, VIII (1882) 687, f. 3.—*G. Regeliana* Gaud. in *Bull. Soc. Bot. France*, LXV (1918) 60.—*l.c.*: Rgl. *l.c.*

Perennial, glabrous, pale green; rootstock not stout, with stringy roots; stems erect or slightly ascending, (10) 12-30 (40) cm long, 1-1.5 mm in diameter, densely closed at base in fibrillose sheaths of old leaves; basal leaves 5-10, oblong-lanceolate to oblong, obtuse, narrowed toward base, 2-10 cm long, 4-8 (10) mm broad, smooth-margined; cauline leaves 2 (3) pairs, narrowly lanceolate, 1.5-3 cm long, 4-6 (10) mm broad; flowers (1) 3-6, in an umbelliform terminal cluster at the top of stem, short-pedicel (f. *typica* Rgl.), or sessile (f. *sessiliflora* Kusn.), or rarely borne on pedicels to 5 cm long (f. *elongata* C. Winkl.); calyx membranous, conical-campanulate, 11-13 (15) mm long, rarely small (f. *Aucherii* Griseb.), one third to half the length of corolla; calyx teeth lance-subulate, 5-6 mm long, acute, the sinuses between the teeth acute; corolla campanulate-obconical, blue or blue-violet, rarely paler, 25-30 mm, rarely 1-2 cm long (f. *parviflora* Rgl.) or 4-5 cm long (f. *grandiflora* Rgl.); corolla lobes oblong-linear or oval, obtusish or acutish, 5-6 mm long, one fifth the length of tube; plaits half as long as the lobes, biparted; ovary stipitate; capsule oblong; seeds wingless, small, finely reticulate. April-June.

Steppes, semideserts, on pebbles and on dry slopes, from lowlands up to the upper mountain zone.—Caucasus: S. Transc.; Soviet Central Asia: Balkh., Mtn. Turkm., Amu D., Syr D., Pam.-Al., T. Sh. **Gen. distr.:** E. Med. (Syria), Bal.-As. Min. (Asia Minor), Arm.-Kurd., Iran. Described from Iran (between Kermanshah and Hamadan). Type in Vienna?

Section 5. **CHONDROPHYLLA** Bge. in *Mem. Soc. Nat. Mosc.* VII, 1824 (1829) 203, 231.—Perennials or annuals; leaves more or less hyaline-margined, the lower ones commonly rosulate; corolla with a distinct limb; plaits symmetrical; large; anthers distinct; capsule commonly short, broadly obovoid, rarely more elongate, long-stipitate; seeds oblong, slightly flattened, wingless.

1. Perennials 2.
- + Annuals 6.
2. Calyx segments with reflexed tips 3.
- + Calyx segments straight 4.
- 571 3. Stem weak, single-flowered, rarely 2-flowered; leaves 2-3 mm broad; corolla 18-21 mm long, color relatively less dark 37. **G. nipponica** Maxim.
- + Stems erect, 5- or 6-flowered; leaves broader, 3-4 (6) mm long; corolla 11-14 mm long, intensely dark green 38. **G. kurilensis** Grossh.
4. Corolla 40-45 (56) mm long, campanulate-infundibular 34. **G. grandiflora** Lxm.

- + Corolla 25-35 mm long, tubular-clavate. 5.
- 5. Corolla (25) 30-35 (36) mm long; plants larger, 4-7 cm tall 35. *G. laciniata* Kit.
- + Corolla (22) 25-29 (35) mm long; plants smaller, 3-5 cm tall 36. *G. djmilensis* C. Koch.
- 6. Branches from the root, simple, terminating in a solitary flower or stems solitary 7.
- + Branches from the middle or above the middle of stem, rarely stems solitary 12.
- 7. Capsule linear-oblong, much longer than broad 8.
- + Capsule obovoid, not more than $1\frac{1}{2}$ times to twice as long as broad . . 10.
- 8. Capsule narrowed at base to thickness of pedicel 41. *G. Karelinii* Griseb.
- + Capsule rounded at base, broader than pedicel 9.
- 9. Plants (3) 5-10 cm tall; flowers commonly nodding, always 5-merous. 40. *G. nutans* Bge.
- + Plants 3-6 cm tall; flowers commonly erect, often 4-merous 39. *G. prostrata* Haenke.
- 10. Leaves spatulate, reflexed-tipped 44. *G. pseudoaquatica* Kusn.
- + Corolla subobtuse or subacute, not reflexed 11.
- 11. Corolla limb blue; corolla 8-10 mm long, 2-3 mm broad at the throat. 43. *G. aquatica* L.
- + Corolla limb white above, with a fairly broad lead-colored or blackish stripe; corolla 9-11 mm long, 3-4 mm broad at the throat 42. *G. leucomelanea* Maxim.
- 12. Corolla medium size, 20-25 mm long, azure; leaves ovate-orbicular, cuspidate 47. *G. Zollingeri* Fawcett.
- + Corolla small, 7-13 mm long 13.
- 13. Stems finely scabrous-glandular; leaves oblong-spatulate, acute, spreading 46. *G. squarrosa* Ldb.
- 572 + Stems glabrous; leaves spatulate-orbicular, obtuse 45. *G. riparia* Kar. et Kir.

Series 1. **Grandiflorae** Grossh. — Perennials calyx segments straight; corolla purple, campanulate-infundibular.

34. *G. grandiflora* Laxm. in Nov. Comm. Acad. Sc. Petropol. XVIII (1774) 526. — *G. altaica* Pall. Fl. Ross. II (1788) 109; Ldb. Fl. Ross. III, 61; Kuzn. Podrod Eugentiana, 211; Kusn. Subg. Eugentiana, 352; Kryl. Fl. Alt. III, 849; Fedch. Rast. Turk. 649; Kryl. Fl. Zap. Sib. IX, 2188. — Ic.: Laxm. l.c. tab. VI, f. 1; Pall. Fl. Ross. II, tab. XCVII, f. 1.

Perennial, glabrous; pale green; rootstock creeping, branching, bearing numerous stems; stems 0.5-4 cm long; leaves narrowly lanceolate, acuminate, 1-3 cm long, 2-6 mm broad, crowded in a dense rosette, below the inflorescence shorter; stems single-flowered; calyx campanulate, 12-20 mm long, half the length of corolla; calyx teeth equal, lanceolate, acuminate, one third to half the length of tube; corolla campanulate-infundibular, dark violet-blue, with 5 green stripes on the outside, (30) 40-45 (56) mm long, 13-18 mm broad below the throat; corolla lobes ovate to broadly ovate, obtuse, entire or slightly serrulate, $1/8$ - $1/7$ the length of tube; plaits $1/4$ to $2/3$ as long as the lobes, broad, rounded, serrate

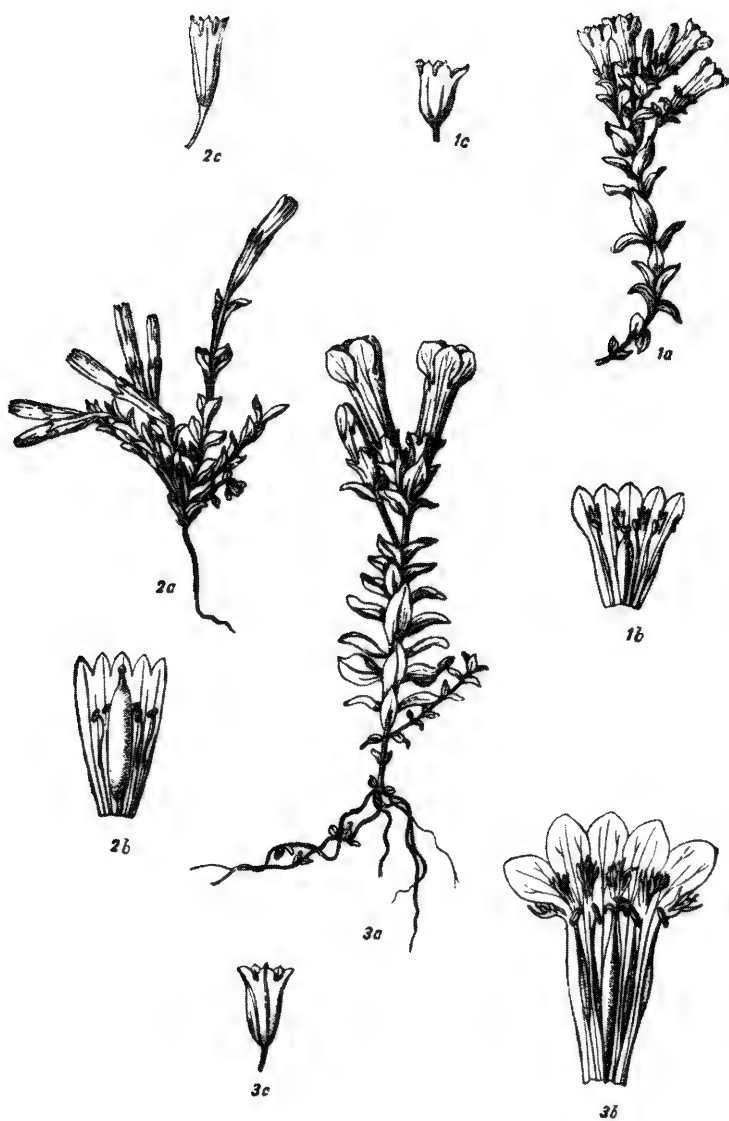


Plate XXX

1a, 1b, 1c. *Gentiana kurilensis* Grossh.—2a, 2b, 2c. *G. nutans* Bge.—3a, 3b, 3c. *G. nipponica* Maxim.

or shallowly split; style long, as long as or somewhat shorter than ovary; ovary stipitate, the stipe as long as ovary, strongly elongating in fruit; capsule ovaloid, narrowed at both ends, exserted from corolla. June-August.

Alpine meadows and tundras, rarely in the upper timber and subalpine zones.—W. Siberia: Alt.; E. Siberia: Ang.-Say., Dau.; Soviet Central Asia: Balkh., Dzu.-Tarb. **Gen. distr.:** Mong. Described from "Lesser Altai". Type in Leningrad.

Series 2. **Pyrenaicae** Grossh. in Dokl. AN Azerb. SSR, III, 3 (1947) 120.—Perennials; calyx segments straight; corolla large, tubular-clavate.

35. **G. laciniata** Kit. apud Kanitz in Verh. zool.-bot. Gesellsch. in Wien, XII (1862) 572.—*G. Vagneriana* Janka, Oest. Bot. Zeit. XXXV (1885) 109.—*G. pyrenaica* var. *laciniata* Javorka in sched. ad fl. Hung. exs., cent. VIII, No. 786.—*G. pyrenaica* auct. mult. (non L.).—Exs.: Fl. Hung. exs. No. 786.

75 Perennial, glabrous, shining green; rootstock creeping, branched, bearing numerous stems and tufts of basal leaves; stems (3) 4-7 cm long, monanthous; leaves narrowly lanceolate to lance-linear, 10-18 mm long, the lowest very short, (1) 2-3 (4) mm broad; calyx tubular-conical, 10-16 mm long, one third to half the length of corolla; calyx teeth equal, lanceolate or narrowly lanceolate, acuminate, 3-5 mm long; corolla tubular-clavate, broad-limbed, bright violet-blue, (25) 30-35 (36) mm long; corolla lobes horizontally spreading to slightly reflexed, oblong-oval, obtusish, 8-10 mm long; plaits the color of corolla, oblong-oval, but slightly shorter than the lobes, slightly narrowed at the top, rather deeply 5-toothed, sometimes almost fringed; anthers distinct, whitish; style well developed; stigmas linear; capsule long-stipitate, exceeding the marcescent corolla, ovaloid-rhomboidal, 5-6 mm long; seeds ovaloid, ca. 0.5 mm long, light brown, wingless, finely reticulate-rugose. June-August.

Meadows in the alpine zone.—European part: U. Dns. (Carpathians). **Gen. distr.:** Centr. Europe (Carpathians). Described from the Carpathians. Type in Vienna.

36. **G. djimilensis** C. Koch in Linnaea, XXIII (1850) 583.—*G. pyrenaica* auct. fl. cauc. non L.—Exs.: GRF, No. 628.

Perennial, glabrous, shining green; rhizome creeping, branched, bearing numerous stems and tufts of basal leaves; stems 3-5 (8) cm long, monanthous; lowest leaves scalelike, very short, 1.5-2 (3) mm broad, the others crowded in a rosette, narrowly lanceolate to lance-linear, 7-11 mm long; calyx unsplit, tubular-conical, 8-12 mm long, two fifths to half the length of corolla; calyx teeth equal, lance-triangular to lanceolate, acute or acuminate, 2-3 mm long; corolla tubular-clavate, broad-limbed, bright blue, (22) 25-29 (35) mm long; corolla lobes horizontally spreading to reflexed, oblong-oval, subobtuse to obtuse, 8-10 mm long; plaits the color of corolla, but slightly shorter than the lobes, oblong-oval, slightly narrowed upward, with 3-4 short teeth at the top; stamens distinct, whitish; style well developed; stigmas linear; capsule long-stipitate, exceeding the marcescent corolla, ovaloid, ca. 5 mm long; seeds ovaloids, ca. 0.5 mm long, light brown, wingless, finely reticulate-rugose. June-August.

Meadows in the alpine zone.—Caucasus: Cisc., Dag., W., E., and S. Transc. **Gen. distr.:** Bal.-As. Min. Described from Pontic Range. Type in Berlin.

Series 3. **Nipponicae** Grossh.—Perennials; calyx segments with reflexed tops; corolla medium size, tubular-campanulate.

- 576 37. **G. nipponica** Maxim. in Mel. Biol. XII (1886) 765; Kuzn. Podrod Eugentiana [Subgenus Eugentiana], 215; Kusn. Subg. Eugentiana, 356.—Ic.: Mountain Vegetation of Southern Sakhalin (1941) (in Japanese language), Plate 23.

Perennial, glabrous, green; rootstock creeping, branched, slender, with numerous short epigeous offshoots; stems slender, weak, sometimes arcuately ascending at base, 6-8 (to 15) cm long, monanthous and rarely also bearing 1 or 2 axillary flowers; leaves ovate, subobtusate, coriaceous, revolute, 5-9 mm long, 2-3 mm broad; calyx unsplit, 5-toothed, narrowly campanulate, 8-9 mm long, half the length of corolla; calyx teeth subequal, ca. 2 mm long, narrowly lanceolate, acute, reflexed; corolla tubular-campanulate, azure, 18-21 mm long; corolla lobes obliquely ascending, oval, obtuse, 7-8 mm long, two-thirds the length of tube; plaits half as long as corolla lobes, oblong, not narrowed and irregularly toothed at the top; stamens equaling the corolla tube; anthers oblong, distinct, with narrowly winged filaments; ovary oblong, borne on a fairly long stipe; style shorter than ovary; stigmas ovaloid. July-August (Plate XXX, Figure 3).

Mountains.—Far East: Sakh. **Gen. distr.:** Jap.-Chi. (Japan). Described from Japan, from Tateyama Mountains. Type in Leningrad.

38. **G. kurilensis** Grossh. sp. n. in Addenda XVII, 750.

Perennial, glabrous, dark green; rootstock creeping, branched, slender, with numerous epigeous offshoots; stems firm, erect, 7-10 cm long, bearing 5 or 6 flowers on unequal pedicels forming a subcorymbose inflorescence; leaves oblong-ovate, subobtusate, coriaceous, revolute, 7-13 mm long, 3-4 (6) mm broad; calyx unsplit, 5-6-toothed, campanulate, 5-6 mm long, one third to half the length of corolla; calyx teeth subequal, ca. 2 mm long, ovate-lanceolate, acute, reflexed; corolla tubular-campanulate, intensely dark blue, 11-14 mm long; corolla lobes subequal, erect, oval, obtuse, ca. 4 mm long, half the length of tube; plaits half as long as corolla lobes, oblong, not narrowed and irregularly toothed at the top; stamens equaling the corolla tube; anthers oblong, distinct, with narrowly winged filaments; ovary oblong, stipitate; style shorter than ovary; styles ovaloid. July (Plate XXX, Figure 1).

Grass and sphagnum bogs.—Far East: Sakh. (Kurile Islands). Endemic. Described from Kompaneiskoe [Urup Island]. Type in Leningrad.

Series 4. **Prostratae** Grossh.—Annuals; corolla small; capsule linear-oblong, much longer than broad.

- 577 39. **G. prostrata** Haenke in Jacq. Coll. II (1788) 66; Kuzn. Podrod Eugentiana [Subgenus Eugentiana], 221, p.p.; Kuzn. in Mat. Fl. Kavk. IV, 1, 340; Kusn. Subg. Eugentiana, 362, p.p.; Grossg. Fl. Kavk. III, 227.—Ic.: Jacq. Coll. II, tab. 17 f. 2; Rchb. Ic. Fl. Germ. XVII, tab. 8, f. 1.2.

Annual, glabrous, grayish-green, with branches spreading from base, 3-6 cm tall; branches numerous from base, simple, decumbent or ascending, monanthous; leaves ovate or rounded-spatulate, smooth-margined, 3-5 mm long, ca. 3 mm broad in upper part, narrowed at base and sheathing, the sheath 1-2 mm long; flowers erect, rarely slightly reclinate but not nodding, 4- or 5-merous; calyx 4- or 5-toothed, narrowly tubular, 7-8 (10) mm long, two thirds the length of corolla; calyx teeth equal, lanceolate, acute, 2-3 mm long, the sinuses between the teeth acute; corolla narrowly tubular, with little spreading limb, 13-18 mm long; corolla lobes bright blue, oval, acute, 4-6 mm long, a quarter to one third the length of tube; plaits half as long as the lobe, oblong, not narrowed upward, minutely toothed at the top; style very short; capsule oblong-linear, ca. 10 mm long, 2-2.5 mm broad, not narrowed and rounded at base, long-stalked, commonly exerted from corolla; seeds 0.5 mm long, ovaloid-cylindric, obtuse, wingless, finely alveolate. July-August.

Wet meadows in the alpine zone. — Caucasus: Dag. (near Kurush).

Gen. distr.: Described from Salzburg (Mt. Kartal and Mt. Frossnitz). Type in Vienna.

40. **G. nutans** Bge. in Ldb. Fl. alt. I (1829) 244 et in Nouv. Mem. Soc. Nat. Mosc. I (1829) 232; Kryl. Fl. Zap. Sib. IX, 2188. — *G. prostrata* Ldb. Fl. Ross. III (1847-1851) 62, non Haenke; Kuzn. Podrod Eugentiana [Subgenus Eugentiana], 221, p. p.; Kusn. Subg. Eugentiana, 362, p. p.; Kom. and Alis. Oprod. rast. Dal'nevost. kr. II, 860. — *G. prostrata* f. *sibirica* Herder, Pl. Radd. (1885) 163. — *lc.*: Bge. in Nouv. Mem. Soc. Nat. Mosc. I (1829) tab. XI, f. 2.

Annual, glabrous, pale green, branching from base, (3) 5-10 cm tall (up to 12 cm in f. major Herder); branches erect or prostrate, simple, monanthous; leaves ovate to ovate-lanceolate, cartilaginous- and smooth-margined, the lowest 3-4, the middle and upper 7-11 mm long, 3-4 mm broad, sheathing, the sheath 2-4 mm long; flowers as a rule strongly arched-spreading or arched-recurved, rarely erect, commonly 5-merous; calyx 5-toothed, narrowly tubular, 8-12 mm long; calyx teeth equal, lanceolate, acute, 2-3 mm long, a quarter to one third the length of tube, the sinuses between teeth acute; corolla narrowly tubular, 14-20 mm long; corolla lobes bright blue, oval, attenuate upward and acuminate, 4-6 mm long, spreading only slightly, a quarter to one third the length of tube; plaits two thirds as long as the lobes, oblong, minutely toothed at the top; style short; capsule oblong-linear, 10-15 mm long, 2-3 mm broad, not narrowed and rounded at base, commonly long-stipitate, exerted from the persistent corolla, rarely shorter; seeds 0.5 mm long, ovaloid, acute, wingless, finely alveolate. July-August (Plate XXX, Figure 2).

Wet places in the alpine zone. — Arctic: Chuk., An.; W. Siberia: Alt.; E. Siberia: all regions; Far East: Kamch. **Gen. distr.:** Dzu.-Kash., Mong. Described from Altai, from the alpine zone, on the Chu R. at the mouth of the Chegai R. Type in Leningrad.

41. **G. Karelinii** Griseb. in DC. Prodr. IX (1845) 106; Ldb. Fl. Ross. III, 62. — *G. prostrata* β . *Karelinii* Kusn. Podrod Eugentiana [Subgenus Eugentiana] (1894) 226; Kusn. Subg. Eugentiana, 368. —

G. prostrata Fedtsch. Rast. Turk. (1915) 649, non Haenke.— *G. longipes* Turcz. in Vestn. estestv. nauk (1860) 1246.

Annual, glabrous, grayish-green, branched from base, 3-5 (10) cm tall; branches numerous, unequal, erect or ascending, simple, terminating in flowers; leaves ovate-spatulate, coriaceous, strongly cartilaginous and scaberulous on the margin, the middle and upper cauline leaves 4-6 mm long, ca. 3 mm broad, sheathing, the sheath 2-4 mm long; flowers erect, rarely somewhat spreading, 5-merous; calyx 5-toothed, narrow-tubed, (7) 8-12 mm long; calyx teeth equal, lanceolate, acute, 2-3 mm long, a quarter to one third the length of tube, the sinuses between the teeth acute; corolla narrowly tubular, 19-20 mm long, the lobes bright blue, oval, attenuate upward and acuminate, 4-6 mm long, spreading only slightly, suberect, a quarter to one third the length of tube; plaits two thirds as long as the lobes, oblong, narrowed upward and toothed at the top; style short; capsule oblong-obconical, gradually narrowed toward base to the thickness of stipe 10-16 mm long, the stalk to 5 cm long or rarely shorter; seeds 0.5 mm long, ovaloid, acute, wingless, finely alveolate. July-August.

Wet places in the alpine zone.— W. Siberia: Alt. (S.); Soviet Central Asia: Balkh., Dzu.-Tarb., Syr D., Pam.-Al., T. Sh. Endemic (?). Described from Dzungaria (erroneously reported for Altai). Type in Geneva.

Series 5. **Aquaticae** Grossh.— Annuals; corolla small; capsule obovoid, not more than 4 times as long as broad.

42. ***G. leucomelana*** Maxim. Diagn. pl. nov. Asiat. VIII (1893) 33; Kuzn. Podrod Eugentiana [Subgenus Eugentiana], 234; Kusn. Subg. Eugentiana, 376; Fedch. Rast. Turk. 649.— *G. leucomelaena* var. *alba* Kusn. Podrod Eugentiana (1894) 235; Kusn. Subg. Eugentiana, 377; Kryl. Fl. Zap. Sib. IX, 2191.— *G. leucomelaena* α . *genuina* Kryl. Fl. Alt. III (1904) 852; Fl. Zap. Sib. IX, 2190.— *G. leucomelaena* β . *pusilla* Kryl. Fl. Alt. III (1904) 853.— *G. aquatica* Clarke in Journ. Linn. Soc. XIV (1875) 434, non L.— *G. prostrata* Clarke, l.c., non Haenke.— *G. aquatica* ssp. *alba* Freyn in Ö.B.Z. (1890) 124.— *G. berezovcaeana* Prodan in Bull. Inform. Cluj, VI (1926) 112.— Ic.: Kuzn. in Mel. biol. XIII (1894) f. 6-10.

Annual, glabrous, grayish-green, fasciculately branched from base, (2) 3-7 cm tall; branches simple, terminating in a flower, numerous, erect, rarely prostrate, rarely few; basal leaves obscurely rosulate, oblong-spatulate, obtuse; cauline leaves commonly shorter than the internodes, oblong, acute, 2-4 (5) mm long, 1-2 mm broad, short-sheathing; flowers erect, 5-merous; calyx tubular-funnelform, 4-5 mm long; calyx teeth equal, lanceolate, acute, 1.5-2 (3) mm long; corolla tubular-clavate, (8) 9-11 (13) mm long, (2.5) 3-4 mm broad at the throat; corolla lobes oval, obtusish, (3) 3.5-4 (5) mm long, half the length of tube, white within, with a fairly broad plumbeous or blackish-blue stripe and white margins, rarely the lobes also white on the outside (f. *alba* Turcz.); plaits half as long as the lobes, subquadrate, not attenuate upward, irregularly toothed at the top; style wanting; stigmas oblong; capsule (2.3) 4-6 (8) mm long, ellipsoid or obovoid, the stipe usually exceeding the corolla; seeds oblong-ellipsoid, longitudinally striated. June-July.

Chiefly in high mountains, in wet meadows and along the banks of streams.—W. Siberia: Alt.; W. Siberia: Ang.-Say, Dau.; Soviet Central Asia: Dzu.-Tarb., Syr Dr., Pam.-Al., T. Sh. **Gen. distr.:** Dzu.-Kash., China, Mong. Described from Kansu Province. Type in Leningrad.

43. **G. aquatica** L. Sp. pl. (1753) 229.—*G. humilis* Stev. in Mem. Soc. Nat. Mosc. III (1812) 258; M.B. Fl. taur.-cauc. III, 191; Ldb. Fl. Ross. III, 63; Boiss. Fl. or. IV, 72; Kuzn. Podrod Eugentiana [Subgenus Eugentiana], 237; Shmal'g. Fl. II, 213; Kuzn. in Mat. Fl. Kavk. IV, 1, 338; Kusn. Subg. Eugentiana, 379; Kryl. Fl. Alt. III, 851; Fedch. Rast. Turk. 649; Grossg. Fl. Kavk. III, 228.—*G. prostrata* Boiss. Fl. or. IV (1879) 72, non Haenke; Kryl. Fl. Zap. Sib. IX, 2189.—Ic.: Bge. in Nouv. Mem. Soc. Nat. Mosc. I (VII) tab. IX, f. 6.—Exs.: Pl. or. exs. No. 166.

580 Annual, glabrous, grayish-green, branched from base, 2-7 cm tall; branches unequal, simple, terminating in a flower, numerous, rarely few or the stems simple; basal leaves indistinctly rosulate, obovate-spatulate, obtuse; cauline leaves oblong, acute to subobtuse, 3-5 mm long, 1-2 mm broad, short-sheathing; flowers erect, 5-merous; calyx tubular, 4-6 mm long; calyx teeth equal, lanceolate, acute, 2-3 mm long; corolla tubular-clavate, 8-10 (11) mm long, 2-3 mm at the throat; corolla lobes oval, acute, 2-3 mm long, half the length of tube, blue throughout on both sides; plaits two thirds as long as the lobes, oval, not narrowed entire or irregularly toothed at the top; style very short; capsule obovoid-spherical, narrowed toward base, (4) 5-6 (8) mm long, the long stipe exerted from corolla; seeds finely reticulate. April-August.

From lowlands (rarely) to the alpine zone, in wet places and near streams and rivers.—Caucasus: Cisc., Dag., W., E., and S. Transc.; W. Siberia: Ob (Tomsk), Alt.; E. Siberia: Ang.-Say., Dau.; Soviet Central Asia (rare): Balkh., Dzu.-Tarb., Syr D., Pam.-Al. **Gen. distr.:** Dzu.-Kash., Mong., N. Am. Described from Siberia. Type in London.

44. **G. pseudoaquatica** Kusn. in Tr. Bot. Sada, XIII, 4 (1893) 63; Kuzn., Podrod Eugentiana [Subgenus Eugentiana], 246; Kusn. Subg. Eugentiana, 388; Kryl. Fl. Alt. III, 853; Fl. Zap. Sib. IX, 2191.—*G. aquatica* Ldb. Fl. Ross. III (1847-1851) 62 (?), non L.—*G. Szcwaldiana* Prodan in Bull. Inform. Cluj, VI (1926) 113.—Exs.: GRF, No. 1231.

Annual, glabrous, grayish-green, branched from base, 2-4 (6) cm tall; branches numerous, unequal, simple or slightly branched, terminating in a flower; basal leaves indistinctly rosulate, larger than the cauline, ovate or orbicular, cuspidate; cauline leaves approximate, obovate-spatulate, cuspidate, reflexed at apex, white-margined, 2-4 mm long, sheathing, the sheaths ca. 2 mm long; calyx narrowly tubular, (4) 5-7 mm long, half the length of corolla; calyx teeth equal, lanceolate, acute, 2-3 mm long, half the length of tube; corolla tubular-clavate, 8-10 (11) mm long, ca. 3 mm broad at the throat; corolla lobes oval, acute, ca. 3 mm long, blue, half the length of tube; plaits blue, oblong, truncate, one third to half as long as the lobes; capsule obovoid, round-topped, narrowed toward base, winged, ca. 5 mm long, the margins of wings dentate, the stipe exerted from corolla; seeds small, reticulate. May-July.

Meadows, wet places, hillocks in swamps, from lowlands to the upper zone. — W. Siberia: Ob, Alt; E. Siberia: Lena-Kol., Ang.-Say., Dau.

Gen. distr.: Ind.-Him., Mong., Jap.-Chi., Tib. Described from Siberia. Type in Leningrad.

- 581 45. **G. riparia** Kar. et Kir. in Bull. Soc. Nat. Mosc. XIV (1841) 706; Ldb. Fl. Ross. III, 63; Kuzn. Podrod Eugentiana [Subgenus Eugentiana], 274; Kusn. Subg. Eugentiana, 417; Kryl. Fl. Zap. Sib. IX, 2192.

Annual, glabrous or slightly scaberulous, grayish-green, (2) 4-10 cm tall; stem simple or branched from the middle or from higher up; branches monanthous; basal leaves obscurely rosulate, orbicular; cauline leaves subdistant, rarely approximate, spatulate-orbicular, obtuse, 2-4 (5) mm long, in upper part 2-3 mm broad; calyx narrowly tubular-funnelform, 6-8 mm long, two thirds the length of corolla; calyx teeth equal, lanceolate, acute, ca. 2 mm long, half the length of tube; corolla tubular-clavate, 9-11 (13) mm long, 3-4 mm broad at the throat; corolla lobes blue, obliquely ascending, oval, acute or obtusish, 3-4 mm long; plaits one third to half as long as the lobes, oval, entire or biparted; style wanting; capsule 2-3 mm long, obovoid, narrowed toward base; seeds ca. 0.3 mm long, cylindric-ovaloid, acute, light brown, finely sulcate-alveolate. May-July.

Up to the alpine zone, in wet meadows, on shores, and in saline places. — W. Siberia: all regions; E. Siberia: Ang.-Say., Dau.; Soviet Asia: Balkh., Dzu.-Tarb., Syr D., **Gen. distr.:** Dzu.-Kash., Mong., N. China. Described from Ayaguz. Type in Moscow.

46. **G. squarrosa** Ldb. in Mem. Acad. Sc. Petersb. V (1815) 520; Ldb. Fl. Ross. III, 64; Kuzn. Podrod Eugentiana [Subgenus Eugentiana], 267; Kuzn. in Mat. Fl. Kavk. IV, 340; Kusn. Subg. Eugentiana, 410; Kryl. Fl. Alt. III, 853; Kom. and Alis. Oprod. rast. Dal'nevost. kr. II, 860; Kryl. Fl. Zap. Sib. IX, 2192. — *G. aquatica* M.B. Fl. taur.-cauc. III, 192, non L. — Ic.: Bge. in Nouv. Mem. Soc. Nat. Mosc. I (VII), tab. IX, f. 3, F.

Annual, grayish-green, 2-5 (7) cm tall; stems densely and minutely glandular-pubescent, ascending or prostrate, the branches from below or from above the middle, monanthous; basal leaves usually distinctly rosulate, orbicular to oval-orbicular, large, 5-11 mm long, 4-8 mm broad, rarely smaller; cauline leaves approximate, oblong-spatulate, acute, spreading, 3-5 mm long, in upper part 2-3 mm broad, narrowly white-rimmed and scabrous on the margin; calyx broadly tubular, slightly inflated, 5-6 mm long, two thirds the length of corolla; calyx teeth oval-oblong, constricted below, arched recurved, ca. 2 mm long; corolla tubular-infundibular with inflated tube, 7-8 (9) mm long; corolla lobes blue, oval, acutish, ca. 3 mm long, half the length of tube; plaits half as long as the lobes, oval-triangular, entire or minutely toothed at the top; style wanting; capsule 3-5 mm long, obovoid-oblong, narrowed toward base, the stipe equaling
582 or slightly exceeding the corolla; seeds ca. 0.3 mm long, ovaloid-cylindric, acute, grayish-brown, finely oblongly alveolate. June-August.

Meadows, steppe slopes, commons, and groves, up to the alpine zone. — W. Siberia: Alt.; E. Siberia: Lena-Kol., Ang.-Say., Dau.; Far East: Ze.-Bu., Uss.; Soviet Central Asia: Balkh., Dzu.-Tarb., T. Sh. **Gen. distr.:** Mong., China, Tib. Described from Transbaikalia. Type in Leningrad.

Series 6. **Zollingerianae** Grossh.—Annuals; corolla medium size, tubular-infundibular; capsule obovoid.

47. **G. Zollingeri** Fawcett in Journ. of Bot. XI (1883) 183; Kuzn. Podrod Eugentiana [Subgenus Eugentiana], 273; Kusn. Subg. Eugentiana, 416; Kom. and Alis. Opred. rast. Dal'nevost. kr. II, 860.—**G. japonica** Maxim. in Mel. biol. IX (1890) 397.

Annual; roots filiform, down to 3-10 cm unbranched, slenderly tufted lower down; stems glabrous, 3-5 (8) cm long, simple or slightly branched at the ends; rosulate leaves none or 1-2 small ones, much smaller than the cauline; cauline leaves 3-5 pairs, ovate-oblong or ovate or ovate-orbicular, cuspidate, 5-8 (13) mm long, 4-7 (10) mm broad, white-rimmed and very minutely scaberulous on the margin, short-sheathing at base; flowers terminal, solitary or in groups of 2-5; calyx narrowly tubular-funnelform, 10-12 (14) mm long, half the length of corolla; calyx teeth lance-oblong, acute, 3-5 mm long; corolla tubular-funnelform, azure, (18) 20-25 mm long; corolla lobes suberect, oval, acute, 3-4 mm long, one fifth to a quarter the length of tube; plaits triangular, acute, shallowly toothed at the top, half as long as the lobe; style short; stigmas oblong, obtuse; capsule broadly obovoid, notched at the top, narrowed toward base, 4-5 mm long, ca. 6 mm broad, the stout stipe exceeding the corolla; seeds very small, wingless. May-July.

In stony soil; scrub, light woods, and wood margins.—Far East: Ze.-Bu., Uss., Sakh. **Gen. distr.:** Manchuria, Japan. Described from Japan, from Kyushu Island. Type in London.

Section 6. **THYLACITES** Griseb. Gent. (1839) 295.—Stems abbreviated, with basal leaf rosette; calyx unsplit; corolla large, blue, minutely patterned within, tubular-infundibular, with erect lobes; plaits asymmetrical; anthers initially fused; stigmas enlarged, dentate-fimbriate, horizontal, initially fused, becoming distinct; capsule narrowed toward base; seeds wingless, flexuously tuberculate.

- 583 1. Leaves coriaceous, rigid, relatively narrow, oblong-lanceolate, acute; calyx teeth lanceolate, enlarged toward base, approximate with an acute angle in between. 48. **G. Clusii** Perr. et Song.
+ Leaves small, relatively broad, broadly elliptic, obtuse or rarely cuspidate; calyx teeth oblong, narrowed toward base with obtuse angles in between. 49. **G. excisa** Presl.

48. **G. Clusii** Perr. et Song. in Bull. Soc. Hist. Nat. Savole (1854) 33.—**G. acaulis** ssp. I, **Clusii** Kusn. Podrod Eugentiana [Subgenus Eugentiana] (1894) 287; Subg. Eugentiana, 431.— **Ic.:** Wien, Ill. Gart. Zeit. XIII (1888) 178; Senn, Alpen-Flora, II (1901) 104.

Perennial, glabrous, pale green, 7-10 cm tall; rootstock slender, slightly creeping; stem abbreviated, with 1 or 2 internodes, terminating in a large flower; leaves of basal rosette rigid, oblong to oblong-lanceolate, slightly narrowed toward base, acute and cuspidate, 2-4 cm long, (4) 7-10 mm broad; cauline leaves strongly reduced, 12-18 mm long, 3-5 mm broad, short-sheathing; calyx tubular-campanulate, 15-20 mm long, half the length of corolla; calyx teeth lanceolate, acute, enlarged

toward base, the sinuses between the teeth acute; corolla tubular-infundibular, dark blue, minutely patterned within, 50-55 (60) mm long; corolla lobes erect, oval, narrowed toward apex, obtuse or mucronulate, 6-8 mm long, many times shorter than the tube; plaits triangular, asymmetrical, simple, half as long as the lobes; anthers fused; stigmas enlarged, dentate-fimbriate, horizontal, initially fused, becoming distinct, capsule oblong, narrowed toward top, not exceeding the corolla; seeds wingless, flat, the surface flexuously tuberculate. June-July.

Calcareous slopes in the alpine, rarely in the subalpine, zone. Known from the Carpathians (Tatra Mts.) and possibly occurring in U. Dns.

Gen. distr.: Centr. Eur. Described from Switzerland. Type in Paris (?).

49. **G. excisa** Presl. in Flora, XI (1828) 263. — **G. Kochiana** Perr. et Song. in Ann. Soc. Hist. Nat. Savoi (1855) 33. — **G. acaulis** ssp. 2 **excisa** Kusn. Podrod Eugentiana [Subgenus Eugentiana] (1894) 295; Subg. Eugentiana, 437, non Presl. — **Ic.:** Weber, Alp.-Pfl. ed. 3 (1872) tab. 285.

Perennial, glabrous, pale green, 7-10 (15) cm tall; rootstock slender, slightly creeping; stems abbreviated, with 1 or 2 internodes, terminating in a large flower; leaves oblong, not rigid, broadly elliptic, narrowed toward base, obtuse, round-tipped or rarely acute, 2-5 cm long, 12-20 584 (25) mm broad; cauline leaves strongly abbreviated, ovate-spatulate, short-sheathing; calyx tubular-campanulate, 12-22 mm long, one third to half the length of corolla; calyx teeth acutish or rarely obtusish, with distant base, the sinuses between the teeth obtuse; corolla tubular-infundibular, dark blue, minutely patterned within, 50-55 (60) mm long; corolla lobes erect, oval, 6-9 mm long, much shorter than the tube, obtuse to nearly round-tipped, often minutely denticulate-margined; plaits asymmetrically triangular, half as long as the lobes; anthers fused, becoming distinct; stigmas, capsule and seeds as in the preceding species. June-July.

Alpine meadows (calcifuge), in the alpine or rarely the subalpine zone. — European part: U. Dns. (Carpathians). **Gen. distr.:** Centr. Eur., W. Med. (Pyrenees). Described from Austria (Schneeberg and Unterberg in Salzburg). Type in Prague.

Section 7. **CYCLOSTIGMA** Griseb. Gent. (1839) 259; DC. Prodr. IX 103.—Perennials, with abbreviated stems, rarely annuals; calyx unsplit; corolla clavate, with cylindric tube and broad limb; plaits symmetrical, rounded or biparted; anthers distinct; stigmas fused into a rounded-clavate structure, commonly with dentate-fimbriate margins; capsule sessile.

- 1. Annuals 2.
- + Perennials 3.
- 3. Calyx broadly winged from the ribs 57. **G. utriculosa** L.
- + Calyx wingless 56. **G. nivalis** L.
- 3. Flowers yellow, 40-42 mm long . . 52. **G. oschtenica** (Kusn.) G. Woron.
- + Flowers dark blue 4.
- 4. Stems usually strongly elongating in fruit, 4-15 (23) cm long; basal leaves always obtuse 5.
- + Stems in fruit 1-6 cm long; basal leaves obtuse or acute 6.

5. Flowers (32) 36-40 (47) mm long; stems in fruit 7-13 (23) cm long; basal leaves 15-20 (25) mm long. 50. *G. Krylovii* Grossh.
 + Flowers (22) 25-30 (31) mm long; stems in fruit 4-15 cm long; basal leaves 6-14 (16) mm long 55. *G. arctica* Grossh.
 6. Flowers (38) 42-45 (50) mm long; stems to 6 cm long.
 51. *G. angulosa* M.B.
 + Flowers smaller on the average; smaller plants 7.
 585 7. Flowers (31) 38-40 (45) mm long 53. *G. pontica* Soltok.
 + Flowers (30) 33-35 (38) mm long 54. *G. verna* L.

50. *G. Krylovii* Grossh. in Dokl. AN Azerb. SSR, III, 1 (1947) 32.—*G. verna* Ldb. Fl. Ross. III (1847-1851) 60, p.p. non L.—*G. verna* α . *angulosa* Kryl. Fl. Alt. III (1904) 855, non Wahlenb.—*G. verna* α . *angulosa* f. *sibirica* Kusn. Podrod *Eugentiana* [Subgenus *Eugentiana*] (1894) 313, p.p.; Subg. *Eugentiana*, 451, p.p.—*G. angulosa* Kryl. Fl. Zap. Sib. IX (1937) 2193, non M.B.

Perennial, green or somewhat yellowish-green; rootstock slender, branched; stems 4-angled, 2-6 (13) cm long, strongly elongating in fruit, up to 7-15 (23) cm; lower leaves in compact rosettes, broadly triangular-ovate, obtuse, sometimes round-tipped, 15-20 (25) mm long, 8-11 (13) mm broad; cauline leaves 1-4 pairs, shorter and narrower, short-sheathing, the sheaths 3-5 mm long, the uppermost pair smaller, close to calyx base; flowers solitary at the end of stem; calyx tubular, slightly inflated, 15-18 (21) mm long, half the length of corolla, the ribs with wings (3) 4-5 mm broad; calyx teeth equal, narrowly lanceolate, acute, (3) 4-5 (7) mm long,; one third the length of tube; corolla tubular, with flat limb, saturated blue, (32) 36-40 (47) mm long, 5-7 mm broad below the throat; corolla lobes ovate, obtuse, (5) 7-11 (16) mm long, one third the length of tube; plaits triangular, biparted, 1/10-1/7 as long as the lobes; ovary sessile or borne on a very short stalk; style short; stigma infundibularly enlarged; capsule oblong-lanceolate; seeds ellipsoid, brownish-gray, 0.5-1 mm long, very finely alveolate-tuberculate. June-August.

Meadows, taluses and bare elevations in the alpine zone.—W. Siberia: Alt.; E. Siberia: Dau.; Soviet Central Asia: Dzu.-Tarb. Endemic. Described from Altai, from Dzhelo-Karakel pass. Type in Leningrad.

51. *G. angulosa* M.B. Fl. taur.-cauc. I (1808) 197; III (1819) 190; Grossg. Fl. Kavk. III, 227.—*G. verna* M.B. Fl. taur.-cauc. III (1819) 190; non L.; Ldb. Fl. Ross. III, 60, p.p.; Boiss. Fl. or. IV, 73, p.p.; Shmal'g. Fl. II, 214.—*G. verna* β . *vulgaris* Lipsky, Fl. Kavk. (1899) 391.—*G. verna* α . *angulosa* Kusn. Podrod *Eugentiana* [Subgenus *Eugentiana*] (1894) 313; Lipskii, Fl. Kavk. 491; Kuzn. in Mat. Fl. Kavk. IV, 1, 347; Kusn. Subg. *Eugentiana*, 451.—*G. verna* var. *alata* Ldb. Fl. Ross. III (1847-1851) 61, p.p.; Boiss. Fl. or. IV, 73, p.p.; Shmal'g. Fl. II, 214.—Ic.: M.B. Cent. plant. rarior. I (1810) tab. 47; Oesterr. Bot. Zeitschr. LI, tab. 3, f. 5, tab. 4, f. 1.—Exs.: Fl. cauc. exs. No. 241.

586 Perennial, glabrous, green or somewhat yellowish-green; rootstock slender, branched; stems 4-angled, 1-6 cm long, elongating in fruit, sometimes up to 10 cm; lower leaves in compact rosettes, elliptic or ovate-oblong or rarely ovate-lanceolate, sometimes obovate, obtuse or subobtuse, (10) 13-16 (20) mm long, 4-8 mm broad; cauline leaves 1-3 pairs, shorter

and usually narrower, short-sheathing, the sheaths 3-5 mm long, the uppermost pair close to calyx base; flowers solitary at the end of stem; calyx tubular, slightly inflated, 5-angled, (14) 20-22 (29) mm long, half the length of corolla, the ribs with wings 2-4 mm broad; calyx teeth equal, narrowly lanceolate, acute, (3) 4-5 (8) mm long, one third the length of tube; corolla tubular, with a flat limb, saturated blue, (38) 42-45 (50) mm long, 6-8 mm broad below the throat; corolla lobes ovate, obtuse, (10) 12-13 (16) mm long, one third the length of tube; plaits triangular, biparted, 1/10-1/7 as long as the lobes; ovary sessile or short-stipitate; style fairly short; stigma infundibularly enlarged; capsule oblong-lanceolate; seeds ellipsoid, brownish-gray, 0.5-0.7 mm long, very minutely alveolate-tuberculate. June-September.

Meadows and gravelly places in the alpine zone.—Caucasus: Cisc., W. and E. Transc., Dag. Endemic. Described from Greater Caucasus. Type in Leningrad.

52. **G. oschtenica** (Kusn.) Woron. Herb. Fl. Cauc. f. XII, No. 582 (VI-31); Grossg. Fl. Kavk. III, 227.—*G. verna* γ . *oschtenica* Kusn. Podrod Eugentiana [Subgenus Eugentiana] (1894) 327; Lipskii, Fl. Kavk. 391; Kuzn. in Mat. Fl. Kavk. IV, 1, 251; Kusn. Subg. Eugentiana, 466.—Exs.: Herb. Fl. Cauc. No. 582; GRF, No. 3232; Fl. cauc. exs. No. 242.

Perennial, glabrous, yellowish-green; rootstock slender, branched; stems 4-angled, 1-2 cm long, elongating in fruit to 6-7 cm; lower leaves in compact rosetted, elliptic or ovate-oblong, obtuse or subobtuse, (6) 15-16 (224 [?]) mm long, (5) 7-8 (12) mm broad, scaberulous-margined; cauline leaves 1-2 pairs, shorter, ovate-lanceolate to lanceolate, short-sheathing, the sheaths 3-5 mm long; uppermost leaves just below the flower, narrower; flower solitary at the end of stem; calyx tubular, slightly inflated, 5-angled, (15) 20-21 (28) mm long, half the length of corolla, the wings from the ribs 2-4 mm broad; calyx teeth equal, narrowly lanceolate, acute, (3) 5 (7) mm long, one third the length of corolla tube; corolla tubular, with a flat limb, lemon-yellow, (34) 40-42 (49) mm long, 6-8 mm broad below the throat; corolla lobes rhomboid-ovate, obtuse, (8) 10-11 (16) mm long, one third the length of tube; plaits triangular, biparted at the top, 1/7-1/6 as long as the lobes; ovary short-stipitate or sessile; style long; capsule oblong-lanceolate, narrowed toward the top; seeds black, small, ca. 0.5 mm long. June-August.

587 Meadows and stony slopes in the alpine zone, chiefly in calcareous areas.—Caucasus: Cisc., W. Transc. Endemic. Described from Mt. Oshten. Type in Leningrad.

53. **G. pontica** Soltok in Oesterr. Bot. Zeitschr. LI (1901) 168; Grossg. Fl. Kavk. III, 227.—*G. verna* ϵ . *obtusifolia* Boiss. Fl. or. IV (1876) 72; Kuzn. Podrod Eugentiana [Subgenus Eugentiana], 329, 330; Kusn. Subg. Eugentiana, 468.—*G. verna* ξ . *Tschichatschevii* Lipsky Fl. Kavk. (1899) 392; Kusn. Subg. Eugentiana, 468.—*G. verna* var. *pontica* Kusn. in Mat. Fl. Kavk. IV (1904) 352.—Ic.: Oesterr. Bot. Zeitschr. LI, tab. 3, f. 11; tab. 4, f. 2.—Exs.: Pl. or. exs. No. 194; Aucher-Eloy, Herb. or. No. 2424; Sint. it. or. 1894, No. 5626.

Perennial, glabrous, green; rootstock slender, branched; stems 4-angled, 1-3 cm long, elongating in fruit to 6-7 cm; lower leaves in compact rosettes, elliptic, ovate or ovate-lanceolate, subacute, subobtuse

or obtuse, 3-nerved, (8) 10-15 (22) mm long, (4) 5-7 (10) mm broad, smooth-margined; cauline leaves 1-3 pairs, narrower, short-sheathing, the uppermost pair just below the calyx; calyx tubular, slightly inflated, 5-angled, (13) 19-20 (28) mm long, half the length of corolla, the wings from the ribs 1-2 mm broad, rarely the calyx almost wingless; calyx teeth equal, narrowly lanceolate, acute, (3) 4-5 (9) mm long, half the length of tube; corolla tubular, with a flat limb, saturated blue, (31) 38-40 (45) mm; long, 6-8 mm broad below the throat; corolla lobes rhomboid-ovate or ovate-elliptic, obtuse, (7) 10-11 (16) mm long, one third the length of corolla; plaits triangular, biparted at the top, $1/8$ - $1/6$ as long as the lobes; ovary sessile or short-stipitate; style rather short; capsule oblong-lanceolate, narrowed at the top; seeds small, ellipsoid. July-September.

Meadows, gravelly and stony places, in the alpine zone.—Caucasus: W., E., and S. Transc. **Gen. distr.:** Bal.-As. Min., Arm.-Kurd., Iran. Described from the Pontic area. Type in Vienna.

54. **G. verna** L. Sp. pl. (1753) 228; Fedch. and Fler. Fl. Evrop. Rossii, 755.—*G. verna* β . *vulgaris* Kittel, Deutschl. Fl. II (1844) 345; Kuzn. Podrod Eugentiana [Subgenus Eugentiana], 323; Kuzn. in Mat. Fl. Kavk. IV, 1, 356; Kusn. Subg. Eugentiana, 461.—*lc.*: Rchb. *lc.* Fl. Germ. XVII, tab. 1048; Hartinger, Atlas Alpenfl. IV, tab. 341.

Perennial, glabrous, green; rootstock slender, branched; stems 4-angled, 1-3 cm long, elongating in fruit to 5-6 cm; lower leaves in compact rosettes, elliptic-lanceolate to elliptic, acute or subacute, rarely obtuse, 3-nerved, 7-15 (30) mm long, 5-8 mm broad, smooth-margined; 588 cauline leaves 1 or 2 pairs, shorter and narrower, short-sheathing, the uppermost pair just below the flower; flower solitary at the end of stem; calyx tubular, slightly inflated, 5-angled, wingless or with wings ca. 1 mm broad (var. *alata* Griseb.), (14) 15-17 (19) mm long, half the length of corolla; calyx teeth equal, narrowly lanceolate, acute, (3) 4-5 mm long, one third the length of tube; corolla tubular, with a flat limb, saturated blue, rarely almost white (f. *alba* Wengenm.) or dark violet (f. *jantina* Wengenm.), (30) 33-35 (38) mm long, 5-6 mm broad below the throat; corolla lobes ovate or rounded-ovate, obtuse, (8) 9 (11) mm long, two fifths the length of corolla; plaits triangular, biparted, $1/6$ - $1/5$ as long as the lobes; ovary sessile, rarely short-stipitate; style long; stigma infundibularly split, dentate-shaggy on the margin; capsule oblong-lanceolate, narrowed toward the top; seeds ellipsoid, small, 0.5-0.7 mm long. June-August.

Meadows, stony and gravelly meadows, in the alpine zone.—European part: U. Dns. (Carpathians). **Gen. distr.:** Scand., Centr. and Atl. Eur., Bal.-As. Min. (Balkans). Described from Switzerland. Type in London.

55. **G. arctica** Grossh. in Dokl. AN Azerb. SSR, III, 1 (1947) 32.—*G. verna* Fedtsch. et Fler. Fl. Evrop. Rossii (1908) 755, non L.—*G. verna* β . *vulgaris* Kusn. Podrod Eugentiana [Subgenus Eugentiana] (1894) 323, p.p.; Kusn. Subg. Eugentiana, 461, p.p.

Perennial, glabrous, green; rootstock slender, branched; stems 1-3 cm long in flower, strongly elongating in fruit and then (4) 6-15 cm long; lower leaves in compact rosettes, elliptic-ovate, narrowed toward apex, obtuse, sometimes round-tipped, 3-nerved, 5-10 (16) mm long, 4-8 (10) mm

broad; cauline leaves 2 or 3 pairs, shorter and narrower, short-sheathing, the uppermost pairs just below the flower; flower solitary at the end of stem; calyx tubular, slightly inflated, 5-angled, (9) 11-15 (16) mm long, half the length of corolla, wingless or with wings ca. 1 mm broad; calyx teeth equal, lanceolate, acute, (2) 3-4 (5) mm long, one third the length of tube; corolla tubular, with a flat limb, saturated dark blue, (22) 25-30 (31) mm long, 4-5 mm broad below the throat; corolla lobes ovate, obtuse, (3) 5-8 (10) mm long, one third the length of tube; plaits triangular, biparted, 1/6-1/5 as long as the lobes; ovary sessile, rarely short-stipitate; style long; stigma infundibularly split, dentate-ciliate on the margin; capsule oblong-lanceolate; seeds ellipsoid, small. May-August.

Tundra, in grass plots and near streams. — Arctic: Arc. Eur.; European part: Dv.-Pech. **Gen. distr.:** Scand., Atl. Eur. (N. England). Described from Kolguyev Island. Type in Leningrad.

56. **G. nivalis** L. Sp. pl. (1753) 229; Ldb. Fl. Ross. III (1847-1851) 60; Boiss. Fl. or. IV, 74; Kuzn. Podrod Eugentiana [Subgenus Eugentiana], 589 338; in Mat. Fl. Kavk. IV, 1, 357; Kusn. Subg. Eugentiana, 477; Fedch. and Fedr. Fl. Evrop. Rossii 785, Grossg. Fl. Kavk. III, 227. — Ic.: Rechb. Ic. Fl. Germ. XVII, tab. 1049, Hartinger, Atlas Alpenfl. IV, tab. 341. — Exs.: GRF, No. 1376; Fl. cauc. exs. No. 242.

Annual, glabrous, green; stems simple or branched, (2) 6-15 (30) cm long, slender; lower leaves rosulate, obovate-oblong to suborbicular, obtuse, 5-10 mm long; cauline leaves distant, ovate or ovate-lanceolate, obtuse to subacute, 6-11 mm long, 2-3 mm broad; flowers solitary at the ends of stems and branches; calyx unsplit, 5-toothed, very rarely 4-toothed tubular, two thirds the length of corolla, (8) 11-16 mm long, wingless, black-striped on the angles; calyx-teeth narrowly lance-linear, elongate-acuminate, 4 mm long, slightly shorter to the tube; corolla 17-24 mm long, tubular, with 5-lobed bright blue limb; corolla lobes ovate-triangular, acute, 4-6 mm long, a quarter to one third the length of tube; plaits very short, whitish, triangular, commonly biparted; filaments of stamens slender; style short; capsule oblong, sessile; seeds very small, ca. 0.2 mm long, oblong, blackish, reticulate-alveolate. June-August.

Wet meadows, stream banks, in the north in lowlands, in the south in the subalpine and the alpine zone. — Arctic: Arc. Eur.; European part: Kar.-Lap, U. Dns.; Caucasus: Cis., Dag., W., S., and E. Transc. **Gen. distr.:** Scand., Centr. and Atl. Eur. Described from Lapland. Type in London.

57. **G. utriculosa** L. Sp. pl. (1753) 229. — *G. bucovinensis* Herbich, Select. plant. rarior. Galiciae et Bucovinae (1836) 10. — Ic.: Rchb. Ic. Fl. Germ. XVII, tab. 1049; Hartinger, Atlas Alpenfl. IV, tab. 340; Penzig, Fl. Alp. Illustr. ed. 2, tab. 29.

Annual, glabrous, green or pale green; stem simple or branched, (3) 10-20 (31) cm long; lower leaves rosulate, obovate to suborbicular, obtuse, 5-10 mm long; cauline leaves (1) 3-6 pairs, ovate to ovate-lanceolate, acute or subacute, 5-10 (12) mm long, (2) 3-4 mm broad; flowers solitary at the end of stem and branches; calyx unsplit, 4- or 5-toothed, two thirds the length of corolla, 18-22 mm long, the wings 3-4 (5) mm broad, terminating in teeth; calyx teeth triangular, acute,

3-5 mm long, a quarter or one third the length of tube; corolla 23-27 mm long, tubular, with 4- or 5-lobed bright blue limb; corolla lobes ovate to ovate-lanceolate, attenuate but obtuse, 8-10 mm long, one third the length of tube; plaits very small, triangular, many times shorter than the lobes; filaments of stamens slender; style rather short; stigma enlarged; capsule oblong-lanceolate, sessile; seeds very small, ca. 0.1 mm long, blackish. June-August.

590 Grassy slopes and wet places in the middle mountain zone. Reported from the European part: U. Dns. (Bukovina). **Gen. distr.:** Centr. Eur., Bal.-As. Min. (Balkans). Described from Switzerland. Type in London.

Subgenus 2. **GENTIANELLA** Kusn., Podrod Eugentiana [Subgenus Eugentiana] (1894) 3.— Calyx lacking an inner membrane, the segments contiguous; plaits between corolla lobes wanting; nectariferous cells present in the lower part inside the corolla; exclusively annuals and biennials.

Section 8. **CROSSOPETALUM** Froel. Gentian. (1796) 109.— Gen. *Gentianopsis* Ma in Acta Phytotaxon. I, 1 (1951) 7.— Flowers 4-merous; calyx unsplit; corolla tubular-infundibular, without a fringed ring in throat, but the margins of corolla lobes often fringed or ciliate; style ovoid or tubular; capsule sessile or stipitate; seeds squamaceous, sometimes narrowly winged at the top; annuals and biennials.

1. All calyx teeth equal; cilia on the margins of corolla lobes numerous, long, about equaling the breadth of lobe 2.
- + Two shorter triangular-lanceolate calyx teeth alternate with two longer narrowly linear-subulate teeth; cilia on the margins of corolla lobes numerous and short or absent. 4.
2. Corolla large, (28) 35-40 (55) mm long; calyx half the length of corolla. 58. **G. ciliata** L.
- + Corolla smaller, (20) 27-32 (44) mm long 3.
3. Calyx teeth as long as the tube; corolla blue, the lobes irregularly toothed-fringed or smooth at apex 59. **G. blepharophora** E. Bordz.
- + Calyx teeth half as long as the tube; corolla dark blue, the lobes minutely and regularly toothed or smooth at apex. 60. **G. Doluchanovii** Grossh.
4. Basal rosette dying off at flowering; stems branched mostly in upper part, rarely simple; corolla lobes commonly ciliate-margined 5.
- + Basal rosette persistent at flowering and fruiting; plants bushy-branched from base, with very long pedicels; corolla lobes commonly without cilia on the margin. 6.
5. Corolla blue, mostly 30-35 (to 65) mm long, 8-12 (15) mm broad at throat; stems simple or weakly branched, with few flowers. 61. **G. barbata** Froel.
- + Corolla tube light-colored, the limb azure; corolla mostly 34-38 mm long, 5-8 (10) mm broad; stems strongly fasciculate-branched, with a large number of flowers 62. **G. Komarovii** Grossh.
6. Commonly a very depressed plant, 8-20 cm tall; corolla (25) 35-38 (42) mm long; subulate calyx teeth much longer than the triangular-lanceolate teeth 63. **G. detonsa** Rottb.

- + Taller plants, (15) 20-40 cm tall; corolla (25) 32-33 (36) mm long; subulate calyx teeth but slightly exceeding the triangular-lanceolate teeth 64. *G. Vvedenskyi* Grossh.

Series 1. *Ciliatae* Grossh. — Corolla lobes profusely ciliate-margined; calyx teeth equal.

58. *G. ciliata* L. Sp. pl. (1753) 231; Ldb. Fl. Ross. III (1847-1851) 59, p.p.; Shmal'g. Fl. II, 214, p.p.; Fedch. and Fedr. Fl. Evrop. Rossii, 755, p.p. — *G. ciliata* β . *humilis* Griseb. Gentian. (1839) 256, p.p.; DC. Prodr. IX, 101, p.p. — *Gentianopsis ciliata* (L.) Ma in Acta Phytotaxon. I, 1 (1951) 19.

Biennial, glabrous, green; stems erect, simple or slightly branched in upper part, very rarely strongly branched (f. *multiflora* Gaud.), 7-25 (30) cm long; lower leaves oblanceolate, the middle and upper ones linear, rarely linear-lanceolate, 1-3 cm long, (1) 2-4 mm broad, acute, single-nerved, smooth-margined; flowers 4-merous, solitary at the end of stem and branches, the entire uppermost leaves close to flower; calyx campanulate, (14) 15-25 (30) mm long, half the length of corolla; calyx teeth half the length of tube, triangular-lanceolate, acuminate, slightly unequal, the two longer alternate with two shorter ones, the longer (4) 5-10 (17) mm long, the sinuses obtuse, occasionally the calyx split on one side and then the teeth closer to the slit longer, to 16 mm; corolla infundibular-tubular, blue, drying grayish-blue, (28) 35-42 (55) mm long 10-14 mm broad below the throat, lobed to the middle, the lobes oblong-obovate, (12) 17-20 (30) mm long, in lower part and on the margin long-ciliate (the length of cilia half the breadth of lobe or more), more or less lacinate-fringed or entire at apex, spiculate; ovary with subsessile broad stigma; capsule stipitate, ellipsoid, much shorter than corolla, the stipe about as long as the capsule seeds with a pellucid alveolate coat. August-September.

Meadows, woods, birch groves, and stony places, from lowlands to the subalpine zone. — European part: M. Dnp., U. Dns., Bes. (?), Bl.

Gen. distr.: Centr. and Atl. Eur. (?), W. Med., Bal.-As. Min. (Balkans). Described from Switzerland. Type in London.

- 592 59. *G. blepharophora* E. Bordz. in Tr. Bot. sada Yur'evsk. univ. XIII (1912) 21. — *G. ciliata* M.B. Fl. taur.-cauc. I (1808) 199, non L.; Ldb. Fl. Ross. III, 59, p.p.; Boiss. Fl. or. IV, 73; Kuzn. in Mat. Fl. Kavk. IV, 1, 358; Grossh. Fl. Kavk. III, 231; Schult. Syst. veg. VI (1820) 175. — *G. ciliata* β . *fimbriata* C. Koch, Linnaea, XVII (1843) 28. — *G. ciliata* β . *humilis* Griseb. Gentian. (1839) 256, p.p. — DC. Prodr. IX, 101, p.p.

Biennial, glabrous, green, 5-20 cm tall; stems erect or sometimes curved, simple or rarely more or less branched, the branches erect; lower leaves obovate-lanceolate or ovate-lanceolate; middle and upper leaves lanceolate to oblong-lanceolate, 1-3 cm long, 2-4 (to 7) mm broad, attenuate upward, acute or acuminate, smooth-margined; flowers 4-merous, commonly at the end of stem and branches; uppermost leaves 1-2 cm below the flower; calyx campanulate, (10) 14-20 (27) mm long, half the length of corolla; calyx teeth about as long as the tube, triangular-lanceolate,

acuminate, slightly unequal, longer, alternating with shorter, the longer (3) 6-10 (14) mm long, the sinuses obtuse, sometimes the calyx split on one side; corolla infundibular-tubular, blue, drying grayish-blue, (23) 26-33 (45) mm long, (8) 10-12 (14) mm broad below the throat, lobed to the middle; corolla lobes oblong-obovate, (8) 12-17 (23) mm long, long-ciliate on the margin in lower part, triangular acute at apex, entire or irregularly laciniolate-fringed, the length of the marginal cilia half the breadth of lobe or more; ovary with subsessile broad stigma; capsule stipitate, the stipe about as long as the capsules. August-September.

Dry meadows, stony and gravelly slopes, up to the subalpine zone.—Caucasus: Cisc., W. and E. Transc., Dag., Tal. **Gen. distr.:** Bal.-As. Min. (Asia Minor). Described from Akhalkalaki. Type in Kiev.

60. **G. Doluchanovii** Grossh. in Dokl. AN Azerb. SSR, IV, 2 (1948) 65.—*G. ciliata* Kryl., Fl. Alt. i Tomsk. gub. III (1904) 840, non L.; Fedch. and Fler. Fl. Evrop. Rossii; 755, p.p.; Fl. Yugo-Vost. VI, 49; Kryl. Fl. Zap. Sib. IX, 2178.

Biennial, glabrous, green; stems erect, sometimes ascending, simple or slightly branched, (5) 10-20 (30) cm long; lower leaves obovate-lanceolate, acute; middle and upper leaves lanceolate to oblong-lanceolate, 1-2 cm long, 2-6 mm broad, attenuate upward, acute, smooth-margined; flowers 4-merous, solitary at the ends of stem and branches; uppermost leaves 1-2 cm below the flower; calyx campanulate, (12) 14-20 (25) mm long, half the length of corolla; calyx teeth about half as long as the tube, triangular-lanceolate, acuminate, slightly unequal, the longer (3) 4-7 (10) mm long, the sinuses obtuse; sometimes calyx split on one side; corolla infundibular-tubular, dark blue, (25) 28-35 (40) mm long, (6) 8-10 (11) mm broad below the throat, lobed to the middle; corolla lobes oblong-obovate, (9) 13-17 (20) mm long, long-ciliate on the margin in lower part, triangular acute at apex, entire or subregularly triangular-toothed, the length of the marginal cilia half the breadth of lobe or more; ovary with subsessile short stigma; capsule about as long as its stipe, much shorter than corolla, ellipsoid. July-August.

Wet and saline meadows, boggy places, and forest glades.—European part: Dv.-Pech., V.-Ka., Transv.; W. Siberia: all regions; E. Siberia: Dau. Endemic. Described from Srotinskii pine forest between the villages of Volchikha and Egor'evka in former Barnaul County. Type in Leningrad.

Series 2. **Barbatae** Grossh.—Corolla lobes glabrous-margined or slightly ciliate; calyx teeth very unequal.

61. **G. barbata** Froel. Gentian. (1796) 114; Ldb. Fl. Ross. III, 59 (cum β . simplex Bge.); Kuzn. in Mat. Fl. Kavk. IV, 1, 360; Fedch. and Fler. Fl. Evrop. Rossii, 756; Kryl. Fl. Zap. Sib. IX, 2178.—*G. barbata* var. *genuina* Kryl. et var. *simplex* Kryl. Fl. Alt. (1904) 841; Kryl. Fl. Zap. Sib. IX, 2178, 2179.—*Gentianopsis barbata* (Froel.) Ma in Acta Phytotaxon. I, 1 (1951) 8.—Ic.: Pall. Fl. Ross. tab. 92, 2; Bot. Mag. VII tab. 639.—Exs.: GRF, No. 25.

Biennial or annual; stems erect, (10) 20-40 (60) cm long, branched chiefly in upper part (f. *genuina* Kryl) or unbranched and shorter (f. *simplex* Bge.); basal leaves rosulate, marcescent, oblong-obovate



Plate XXXI

1. *Gentiana caucasica* M.B.— 2. *G. auriculata* Pall. 3.— *G. paludicola* Koidzumi.

to oblong, obtuse; cauline leaves linear-lanceolate to linear, obtuse, 2-4 (10) cm long, 1.5-5 (10) mm broad, not sheathing; flowers 4-merous, solitary at the ends of stem and branches, long-peduncled, the peduncles several times the length of calyx, without subtending leaves; calyx narrowly campanulate, (20) 23-25 (27) mm long, two thirds the length of corolla; calyx teeth unequal, about as long as or longer than tube, two teeth
596 triangular from a broad base, linear-subulate, sharply carinate, acuminate; corolla narrowly infundibular-tubular, blue, (25) 30-35 (65) mm long, 8-12 (15) mm broad below the throat, lobed to one third or rarely to the middle; corolla lobes oblong-obovate, obtuse, entire or slightly toothed at apex; marginal cilia few, usually shorter than half the breadth of lobe or rarely absent; style short; stigma broad; capsule ovaloid-oblong, the stipe half the length of capsule; seed with a transparent alveolate coat. July-August.

Forest glades, meadow slopes, wood margins, and saline river banks, in the subalpine and alpine zones.— Arctic: An.; European part: V.-Ka., Transv.; W. Siberia: Ob, Irt., Alt; E. Siberia: all regions; Far East: Okh., Ze.-Bu.; Soviet Central Asia: Dzu.-Tarb.; T. Sh. **Gen. distr.:** Mong., Jap.-Chi. (N. China). Described from the Tom River. Type in Berlin?

62. **G. Komarovii** Grossh. in Dokl. AN Azerb. SSR, IV, 2 (1948) 66.— **G. detonsa** Kom. in Kom. and Alis. Oprod. rast. Dal'nevost. kr. II (1932) 863, non Rottb.

Annual or biennial, glabrous, pale green; stems erect, (10) 35-60 cm long, strongly fasciculate branched above base, the erect branches terminating in a long-pedicelled flower thus the plants many-flowered, with 12-40 flowers per stem; depressed forms sometimes occur, 10-15 cm tall, 1-5-flowered (f. *pumila* Grossh.); basal leaves rosulate, oblong, obtuse, deciduous at flowering time, lance-linear, acuminate, 2-4 cm long, 2-3 (4) mm broad, not sheathing; flowers long, without subtending leaves; calyx narrowly campanulate, (20) 25-30 (34) mm long, from two thirds the length of corolla to (sometimes) about equal to it; calyx teeth unequal, the two longer ones (8) 11-15 (20) mm long, the length of the tube, the shorter teeth triangular from a broad base, acute; corolla narrowly campanulate-tubular, with a light-colored (white?) tube and pale blue limb, (20) 34-38 (43) mm long, 5-8 (10) mm broad at throat, commonly lobed to one third; corolla lobes obovate or oblong-obovate, (8) 10-13 (15) mm long, smooth or minutely toothed at apex, the margins glabrous or with 2-5 short white cilia; style short; stigma broad; capsule oblong, narrowed into a stipe; seeds very small, 0.1-0.2 mm long, ovaloid, finely pellucid-alveolate. July-September.

Scrub, meadows, and wastelands.— Far East: Ze.-Bu., Uda, Uss. Endemic. Described from Suifun Valley. Type in Leningrad.

63. **G. detonsa** Rottb. Act. hafn. X (1770) 435, tab. 1, f. 3; Ldb. Fl. Ross. III, 59.— **G. serrata** Fedtsch. in Fedch. and Fler. Fl. Evrop.
597 **Rossii** (1908) 756, non Gunner.— **Gentianopsis detonsa** (Rottb.) Ma in Acta Phytotaxon. I, 1 (1951) 19.— **Ic.:** Rott. l.c.

Annual and biennial, glabrous, green; stems erect, (8) 10-20 (23) cm long, simple or with long upright branches nearly from base; flowers

solitary, at the ends of stem and branches, on peduncles 3-10 cm long; basal leaves rosulate, persistent at flowering and fruiting, oblong-spatulate, obtuse; cauline leaves 1 or 2 (3) pairs, linear-lanceolate or linear, acute, (10) 15-20 (25) mm long, ca. 2 mm broad, not sheathing; flowers 4-merous, without subtending leaves; calyx narrowly campanulate, (17) 20-25 (26) mm long, two thirds the length of corolla; calyx teeth unequal, the longer about equaling the tube, (5) 7-10 (12) mm long, the two longer teeth lance-subulate acuminate, the two shorter ones triangular from a broad base, acute, sometimes hyaline-margined; corolla narrowly infundibular-tubular, dark blue, (25) 35-38 (42) mm long, 7-9 mm broad below the throat, lobed nearly to the middle; corolla lobes oblong-obovate, obtuse, (7) 10-12 (17) mm long; nearly always serrulate at apex, the margins smooth or very rarely with 2 or 3 short cilia; style short; stigma broad; capsule ovaloid-oblong, stipitate; seeds very small, 0.2-0.3 mm long, angularly ovaloid, with a pellucid alveolate coat. July.

Wet places, along shores. — Arctic: Arc. Eur.; European part: Dv.-Pech. **Gen. distr.:** Arc., Scand. Described from Norway. Type in Denmark?

Note. Fedchenko and Flerov (l.c.) report for Finland *G. serrata* Gunner which they consider as synonymous with *G. detonsa*. *G. serrata* was described as a plant with 5-merous flowers and the description was published two years later (1772) than that of *G. detonsa*. *G. serrata* is apparently a distinct arctic species and it does not occur in the USSR.

64. **G. Vvedenskyi** Grossh. sp. n. in Addenda XVII, 751. — *G. barbata* Fedtsch. Rast. Turk. (1915) 649, p.p. non Froel.

Annual or biennial, glabrous, green; stems erect, (15) 20-40 cm long, simple (rarely) or with long and usually numerous branches arising nearly from base; flowers solitary at the ends of stem and branches; peduncles commonly 10 (to 30) cm long; basal leaves rosulate, persistent at flowering and fruiting, oblong-spatulate, obtuse; cauline leaves 1-2 (3) pairs, linear-lanceolate to linear, acute, 20-35 mm long, 2-3 (4) mm broad, 598 sheathing at base; calyx narrowly campanulate, (18) 24 (33) mm long, two thirds the length of corolla; calyx teeth unequal, the longer about equaling the tube, (8) 11 (19) mm long, lance-subulate, acuminate, the shorter triangular from a broad base, acute, hyaline-margined; corolla narrowly campanulate-tubular, dark blue, (25) 32-33 (36) mm long, 7-10 mm broad below the throat, lobed to one third or lower; corolla lobes oblong, obtuse, commonly serrulate at apex, (10) 11 (13) mm long, smooth-margined; without cilia; style short; stigma broadly oblong; capsule ovaloid-oblong, short-stipitate; seeds very small, 0.2-0.3 mm long, ovaloid, covered with pellucid scales. June-August.

Marshy places and wet meadows in the alpine zone. — Soviet Central Asia: Pam. Al., T. Sh. **Gen. distr.:** Dzu.-Kash., Mong. Described from Lyangar-su River in Pamir. Type in Leningrad.

Section 9. **ENDOTRICHIA** Froel. Gentian. (1796) 86, p.p. — Flowers 5-merous, rarely 4-merous; calyx unsplit, rarely split; corolla limbed, with a fringed crown, very rarely without it; style wanting; stigma ovaloid-oblong; capsule sessile or stipitate; annuals or biennials.

1. Fringed crown in corolla throat wanting. 73. **G. Lipskyi** Kusn.
- + Throat of corolla always with a well developed fringed crown 2.
2. Calyx cordately enlarged at base; flowers 4-merous or 5-merous, sometimes both types on same plant 67. **G. auriculata** Pall.
- + Calyx never cordate at base 3.
3. Flowers as a rule 4-merous; two sepals markedly broader than and covering the others. 4.
- + Flower as a rule 5-merous; sepals equal or slightly different 5.
4. Annual; rosulate leaves ovate or lanceolate; cauline leaves ovate-lanceolate, acute 65. **G. baltica** Murb.
- + Biennial; rosulate leaves rounded obtuse; lower cauline leaves ovate obtuse; middle and upper leaves oblong or lanceolate, obtuse, rarely acute 66. **G. campestris** L.
5. Ovary and capsule sessile, very rarely short-stipitate 6.
- + Ovary and capsule distinctly stipitate 11.
6. All leaves, including the rosulate, lanceolate, acute; corolla rose-blue. 79. **G. paludicola** Koidzumi.
- + Leaves of basal rosette spatulate, rounded-obtuse, rarely attenuated toward apex, obtuse 7.
- 599 7. Annual, commonly 5-13 cm tall; stems with 2 or 3 internodes and few flowers; rosulate leaves attenuated upward. . . 74. **G. uliginosa** Willd.
- + Biennials, mostly taller, with a larger number of internodes and numerous flowers; basal leaves enlarged in upper part, spatulate . . 8.
8. Calyx split nearly to base. 9.
- + Calyx tube pronounced, half to two thirds the length of teeth 10.
9. Plants 20-40 cm tall; stem internodes (4) 6-10; sepals relatively narrow, acuminate 78. **G. acuta** Mchx.
- + Plants 10-30 cm tall; internodes 3-6 (7); sepals somewhat broader, acute 77. **G. plebeja** Cham. et Schlecht.
10. Stem internodes 3-6, of these the second or the third much longer than the rest; middle leaves obtuse, shorter than internodes; sinuses between calyx teeth acute. 75. **G. lingulata** Agardh.
- + Stem internodes 6-12, about equal in length; middle leaves acute, equaling or exceeding the leaves; sinuses between calyx teeth obtuse. 76. **G. axillaris** (F.M. Schmidt) Murb.
11. Sinuses between calyx teeth acute 68. **G. Biebersteinii** Bge.
- + Sinuses between calyx teeth obtuse 12.
12. Sepals straight, contiguous. 13.
- + Sepals commonly recurved; margin or calyx with gaps between the sepals; calyx apparently truncate 14.
13. Stem internodes 3-5; cauline leaves obtuse, always shorter than internodes. 69. **G. praecox** A. et J. Kerner
- + Stem internodes 6-15; cauline leaves acute or subacute, longer or rarely shorter than internodes 70. **G. carpaticola** Borb.
14. Corolla more yellow, (18) 22-25 (30) mm long. 71. **G. caucasica** M.B.
- + Corolla less yellow, larger, (23) 29-38 (45) mm long. 72. **G. Marcowiczii** Kusn.

65. *G. baltica* Murb. in Acta Horti Bergiani, II, 4, No. 3 (1892) 4.

Annual, glabrous, dark green; stems erect, (2) 7-16 (25) cm long, rarely simple, commonly branched from base or from the middle, the short
600 branches forming a racemose or umbellate 4-10-flowered inflorescence; basal leaves rosulate, ovate, lanceolate or obovate, obtuse or subobtuse lower cauline leaves ovate-lanceolate, acute; upper leaves ovate-lanceolate or triangular, acute, glandular-ciliolate on the margin, (8) 10-15 (20) mm long, (3) 5-8 (10) mm broad; flowers 4-merous; calyx tubular-campanulate, 9-10 mm long, two broadly ovate acute teeth embracing and alternating with two lanceolate or linear acute or acuminate teeth; all teeth much longer than the tube, the sinuses between the teeth acute; corolla tubular, (16) 18-26 mm long, 5-7 mm broad at throat, half as long again as calyx, with light-colored tube and blue lobes or rarely lobes pale to nearly white; corolla lobes 5-8 mm long, oval, obtuse; crown sparsely long-fimbriate; ovary and capsule sessile or short-stipitate; seeds very small, 0.2-0.3 mm long, globose, light brown, faintly rugose. August-October.

Meadows and grassy slopes. — European part: Balt. **Gen. distr.:** Scand. (S.), Centr. and Atl. Eur. Described from Norfolk in England (the first reported location). Type in Bergen.

66. **G. campestris** L. Sp. pl. (1753) 231, s. str. — Ldb. Fl. Ross. III, 55; Shmal'g. Fl. II, 215; Kuzn. in Mat. Fl. Kavk. IV, 1, 368; Fedch. and Fler. Fl. Evrop. Rossii, 765; Grossg. Fl. Kavk. III, 230. — **G. obtusifolia** Ldb. Fl. Ross. III (1847-1851) 54, non W.; Shmal'g. Fl. II, 215. — Ic.: Wettst. Monogr. tab. III, f. 9, 10; tab. IV, f. 3. — Exs.: GRF, No. 24; Fl. exs. Austro-Hung. No. 184.

Biennial, glabrous, dark green; stems erect, (3) 7-20 (25) cm long, rarely simple, commonly branched from base or from the middle, the straight branches forming a racemose or filiform [?] 3-20-flowered inflorescence; remnants of old leaves usually present at base of flowering stem; lower leaves rosulate, obovate-spatulate, rounded-obtuse, broadest in upper part, 12-30 mm long, 5-10 mm broad; lower cauline leaves oblong, obtuse, 13-20 mm long, ca. 5 mm broad; upper leaves oblong or lanceolate, obtuse or rarely acute, minutely glandular-ciliolate on the margin; flowers 4-merous; calyx tubular-campanulate, (10) 13-16 (20) mm long two broad ovate acute teeth embracing and alternating with two narrowly lanceolate or linear acute or acuminate teeth, all teeth much longer than tube, the sinuses between the teeth acute; corolla tubular, dark blue with lighter tube, rarely blue to nearly white, (15) 18-25 (30) mm long, 5-7 mm broad at throat, half as long again as calyx, the lobes 5-8 mm long, oval, obtuse; crown sparsely
601 long-fimbriate; ovary and capsule borne obliquely on a short-stipe; seeds very small, 0.2-0.3 mm long, globose, light brown, finely rugose. May-October.

Meadows and grassy slopes. — European part: Balt. (S.), Dv.-Pech. (Vologda). **Gen. distr.:** Arct., Scand., Centr. and Atl. Eur., W. Med. Described from Europe. Type in London.

Note. Two seasonal forms occur: 1) ssp. *suecica* Froehl. Gentian. (1796) 92, flowering from May to July, the 3-5 internodes longer than leaves, and 2) ssp. *germanica* Froehl. Gentian. (1796) 94, flowering from end of July to October, the 4-11 internodes shorter than leaves.

67. **G. auriculata** Pall. Fl. Ross. II (1788) 102; Ldb. Fl. Ross. III, 55; Kom. Fl. Kamch. III, 35; Kom. and Alis. Opred. rast. Dal'nevost. kr. II, 863. — Ic.: Pall. Fl. Ross. II, tab. XCII, f. 1.

Annual or biennial, glabrous; stems erect, 15-40 cm long, rarely 5-10 cm (*f. pumila* V. Vass.), occasionally simple (*f. simplicior* V. Vass.), commonly branched from the middle or rarely from base, the upright branches forming a many-flowered paniculate-racemose inflorescence; basal leaves rosulate, small, oblong-oval, obtuse, early deciduous; lower and upper cauline leaves ovate-lanceolate or rarely lanceolate, obtuse or subobtuse, 18-25 (to 50) mm long, 6-12 (18) mm broad, not sheathing, the upper ones smooth-margined; flowers mostly 4-merous, rarely 5-merous; calyx tubular, 11-15 mm long; two calyx segments ovate, broad subcordate and more or less distinctly auriculate at base, obtuse; other segments narrower, oblong or oval, obtuse; corolla tubular, dark blue-violet, with lighter tube, rarely pale blue (*f. albo-coerulea* V. Vass.), (17) 20-25 mm long, 3-5 mm broad, twice the length of calyx, the oblong obtuse lobes 5-7 mm long; crown of 4 or 5 trapezoid fimbriate-topped lobes; seeds very small, 0.2-0.3 mm long, ovaloid-globose, brownish. July-August (Plate XXXI, Figure 2).

Meadows and gravelly slopes.—Arctic: Chuk., An.; E. Siberia: Lena-Kol.; Far East: Okh., Uda, Kamch., Sakh. Endemic. Described from the Sea of Okhotsk coasts. Type in Leningrad.

68. **G. Biebersteinii** Bge. Monogr. Gentian. (1829) 247; Ldb. Fl. Ross. III, 54; Kuzn. in Mat. Fl. Kavk. IV, 361; Grossg. Fl. Kavk. III, 230.—*G. obtusifolia* Boiss. Fl. or. IV (1879) 70, non W.—*G. Biebersteinii* *f. typica*, *f. Buschiana*, *f. atrata* and *f. pseudobulgarica* Kusn. l.c. 366; Grossg. Fl. Kavk. III, 230.—*Ic.*: Bge. Monogr. tab. X, f. 1.—*Exs.*: Sint. It. or. 1890 No. 3402.

Biennial, glabrous, dark green; leaves, stems and calyx sometimes blackish-red (*f. atrata* Kusn); stems erect, commonly branched, with 502 5-9 internodes, 4-6 cm long (*f. pseudobulgarica* Kusn.), but mostly 7-25 (40) cm long; rosulate leaves spatulate, rounded-obtuse, usually deciduous in flower; cauline leaves ovate or oblong, 10-20 (35) mm long, 6-10 (15) mm broad, obtuse, rarely acute; flowers numerous, 5-merous, very rarely 4-merous; calyx tubular-funnelform, 12-16 mm long; two calyx teeth broader, oval-lanceolate, the others narrowly lanceolate, all acute or acuminate, 7-9 mm long, commonly twice as long as tube, glabrous or villosulous-margined, sometimes the margin of teeth and nerves of tube densely hairy (*f. papillosa* Grossh.), the sinuses between the teeth acute; corolla tubular-infundibular, with yellowish tube and dingy violet or yellowish limb, 10-20 mm long (*f. typica* Kusn.) or rarely 20-30 mm long (*f. Buschiana* Kusn.); corolla lobes oval, obtuse, mucronate, 6-8 mm long, one third to half the length of tube; capsule mostly long-stipitate, rarely short-stipitate or sessile. July-September.

Meadows in the subalpine and alpine zones.—Caucasus: Cisc., W. Transc., Dag. (?). Endemic. Described from the Mineral'nye Vody [town] area. Type in Leningrad.

Note. Weakly pronounced seasonal dimorphism may be noted: *f. typica* — a predominantly summer form, and *f. Buschiana* — predominantly fall; *f. papillosa*, so far known only from two locations in the Central Caucasus, probably represents a distinct race, eastern in relation to *G. Biebersteinii*, but the insufficient and badly preserved material does not allow precise clarification of its position.

69. **G. praecox** A. et J. Kerner in Verh. zool.-bot. Gesellsch. XXXVIII (1889) 669. — **G. Amarella** ϵ . *obtusifolia* Ldb. Fl. Ross. III (1847-1851) 53. — (?) **G. Amarella** β . *pyramidalis* Ldb. l.c. 53.

Biennial, glabrous, green; stems 10-16 (25) cm long, erect, mostly branched, with 3-5 internodes, the second and third internode much longer than the rest; basal leaves rosulate, oblong-spatulate, obtuse, deciduous in flower; cauline leaves shorter than internodes, oblong to linear-oblong, 15-20 (25) mm long, 4-5 mm broad, obtuse; uppermost leaves acutish, glabrous; flowers 5-merous; calyx tubular-funnelform, (7) 9-12 (14) mm long; calyx teeth slightly unequal, linear to oblong-linear, as long as or slightly longer than tube, the sinuses obtuse or acutish; corolla tubular-infundibular, dark blue, sometimes almost white (f. *alba* Hegi), (18) 22-25 mm long; 7-10 mm broad below the throat, twice the length of calyx; corolla lobes oblong-ovate, obtuse, 7-10 mm long, the crown sparsely
603 long-fimbriate; capsule linear-oblong, narrowed into stipe; seeds small, 0.3-0.4 mm long, globose, light brown, smooth. June-July.

Mountain meadows. — European part: U. Dns. (Carpathians). **Gen. distr.:** Centr. Eur. Described from lower Austria. Type in Vienna.

70. **G. carpaticola** Borb. in Prodan, Fl. Roman. I (1923) 828. — **G. carpatica** Wettst. in Oesterr. Bot. Zeitschr. 42, 4.

Annual, glabrous, green; stem 8-20 (40) cm long, erect, strongly branched, with 6-15 internodes, the second and third internodes little longer than the rest; basal leaves rosulate, oblong-spatulate, small, deciduous in flower; cauline leaves shorter or longer than internodes, broadly lanceolate, acute or subacute, 10-20 (35) mm long, 4-7 mm broad, glabrous; flowers 5-merous; calyx (8) 9-12 (15) mm long; calyx teeth slightly unequal, linear to oblong-linear, acute, equaling or slightly exceeding the tube, the sinuses obtuse; corolla tubular-infundibular, dark blue, rarely whitish, 18-25 mm long, 7-9 mm broad at throat, twice the length of calyx; corolla lobes ovate-oblong, commonly acute or mucronate, 7-9 mm long, the crown profusely long-fimbriate; capsule linear-oblong, narrowed into a stipe; seeds small, globose, smooth. August-October.

Mountain meadows. — European part: U. Dns. (Carpathians). **Gen. distr.:** Centr. Eur. Described from Carpathian Mts. Type in Vienna.

Note. **G. praecox** and **G. carpaticola** are two seasonal species, of the summer and fall respectively.

71. **G. caucasica** M.B. Fl. taur.-cauc. I (1808) 198; III (1819) 198; Ldb. Fl. Ross. III, 54; Boiss. Fl. or. IV, 70; Shmal'g. Fl. II, 215; Kuzn. in Mat. Fl. Kavk. IV, 1 (1904) 372; Grossg. Fl. Kavk. III, 230. — **G. caucasica** var. *coerulescens* Trautv. and var. *flavescens* Trautv. and Tr. Bot. Sada, VII (1880) 483; Kuzn. l.c.; Grossg. l.c. — Ic.: Wettst. in Oesterr. Bot. Zeitschr. XLI, tab. XIII, f. 6; Ej. Monogr. tab. IV, f. 15. — Exs.: GRF, No. 1374; Pl. or. exs. No. 167.

Biennial, glabrous, pale green; stems branched, often from base, rarely from upper part, 7-25 (30) cm long, with 2-4-internodes; rosulate leaves small, spatulate, tapering at base into petiole, round-tipped, commonly deciduous in flower; cauline leaves oblong to ovate-oblong, obtuse, the uppermost subacute, 10-20 (30) mm long, 4-8 (10) mm broad, smooth-margined; flowers 5-merous, very rarely 4-merous, 2-15 on the stem, very rarely stems monanthous, calyx commonly

split on one side to the middle or lower down, (9) 11-17 (23) mm long; calyx teeth unequal, recurved, two somewhat broader and longer, the other two narrower and shorter, all (5) 7-9 (13) mm long, commonly somewhat longer than tube, the sinuses obtuse hence the calyx apparently truncate; corolla tubular-infundibular, (18) 22-25 (30) mm long, 4-6 mm broad at throat, with pale yellow tube and bluish-violet limb (var. *coerulescens* Trautv.) or rarely with light yellow limbs (var. *flavescens* Trautv.); corolla lobes oval, obtuse (4) 5-7 mm long, the crown profusely fimbriate; capsule narrowly oblong, stipitate; seeds small, 0.3-0.5 mm long, ovaloid, light brown, finely alveolate-tuberculate. June-August (Plate XXXI, Figure 1).

Meadows in the alpine and subalpine zones.—Caucasus: Cisc., W., E., and S. Transc., Dag. **Gen. distr.:** Bal.-As. Min. (Asia Minor). Described from the Caucasus. Type in Leningrad.

72. **G. Marcowiczii** Kusn. in Del. plant. exs. Hort. Bot. Juriev, II, (1899) 41; Grossg. Fl. Kavk. III, 230.—*G. caucasica* var. *Marcowiczii* Kusn. in Mat. Fl. Kavk. IV, 1 (1904) 377.—*G. caucasica* Loddyg. in Curtis Bot. Mag. (1807) tab. 1038, non M.B.—Ic.: Loddyg. l.c.

Biennial, glabrous, green; stems (5) 15-20 (40) cm long, erect or slightly ascending, commonly branched from base or from the middle, with 4-6 (to 15) internodes; rosulate leaves small, spatulate, obtuse, narrowed into petiole; cauline leaves broadly ovate to ovate-lanceolate, often subcordate at base, 3-7-nerved, acute, scabrous-margined, 15-25 mm long, 8-12 (15) mm broad; flowers 5-merous, very rarely 4-merous, numerous (up to 40 flowers per stem), rarely the stems monanthous; calyx tubular, mostly unsplit, rarely split, (11) 15-19 (22) mm long; calyx teeth narrowly linear, acute, commonly erect, 7-11 (13) mm long, two slightly broader, the others narrower; the sinuses obtuse; corolla tubular-infundibular, twice the length of calyx, (23) 29-38 (45) mm long, 6-8 mm broad at throat, with pale yellow tube and violet limb; corolla lobes oval, obtuse, 8-12 mm long, the crown profusely fimbriate; capsule oblong, stipitate; seeds as in the preceding species. August-October.

Meadows in the alpine and subalpine zones.—Caucasus: Cisc., Dag. Endemic. Described from the Digora area. Type in Leningrad.

Note. *G. caucasica* and *G. Marcowiczii* are seasonal species, of the summer and fall respectively.

73. **G. Lipskyi** Kusn. in Tr. Bot. Sada, XIII (1894) 361; Kuzn. in Mat. Fl. Kavk. IV, 1, 383; Grossg., F. Kavk. III, 231.—Exs.: GRF, No. 1373.

Biennial, glabrous, green; stems slender, erect, 14-30 cm long, moderately branched from base or from the middle, with 4 or 5 internodes, of these the lowest short, the second and third very long; rosulate leaves usually persistent in flower, obovate, obtuse, 7-10 mm long; cauline leaves much shorter than internodes, broadly ovate or ovate, often subcordate at base, 7-15 (20) mm long, 5-10 mm broad, the lower ones obtusish, the upper acute; flowers 5-merous, 5-15 per stem, long-pedicel; calyx unsplit, rarely split, 15-18 mm long; calyx teeth narrowly linear, acuminate, erect or recurved, slightly exceeding the tube, 8-10 mm long, the sinuses obtuse; corolla tubular-infundibular, with light-colored tube and dark violet limb, 22-28 mm long, 4-6 mm broad at throat, twice the length of calyx; corolla lobes oval, obtuse, 6-8 mm long, $1\frac{1}{2}$ times to twice

the length of tube; throat unfringed or rarely sparsely fimbriate; capsule sessile; seeds small, ovaloid. June-July.

Meadows of the alpine zone.—Caucasus: Cisc. Endemic. Described from Khulamvtsek. Type in Leningrad.

74. **G. uliginosa** Willd. Sp. pl. I (1797) 1347; Fedch. and Fler. Fl. Evrop. Rossii, 757.—*G. lancifolia* Raf. ex Bge. Monogr. Gentian. (1829) 248.—*G. amarella* ϵ . *uliginosa* Ldb. Fl. Ross. III (1847-1851) 53.—*l.*: Rchb. Pl. crit. tab. 118, 119.—Ecs.: GRF, No. 1484.

Biennial, glabrous, green; stems (3) 5-13 (25) cm long, simple or weakly branched, with 2 or 3 (4) internodes; basal leaves persistent in flower, obovate or lanceolate, sheathing, attenuate toward apex, obtuse; lower cauline leaves ovate-lanceolate to lanceolate, subacute, 10-15 mm long, 3-6 mm broad, upper cauline leaves ovate or triangular-lanceolate, acute, smooth along entire margin. Flowers 5-merous; calyx 7-10 mm long, teeth about twice the length of tube, unequal, linear-lanceolate to lanceolate, the sinuses acute or obtusish; corolla tubular, dingy violet or whitish, (9) 12-16 (20) mm long, 3-4 mm broad at throat; corolla lobes oval, obtuse, mucronate, 3-4 mm long; ovary and capsule sessile. August-October.

Dry meadows and banks of streams.—European part: Balt., Lad.-Ilm.; Dv.-Pech., V.-Ka. **Gen. distr.**: Scand. (S.), Centr. and Atl. Eur. Described from W. Europe. Type in Berlin.

75. **G. lingulata** Agardh in Lunds Phisiograph. Sällskaps Årsberättelse (1825) 29; Fedch. and Fler. Fl. Evrop. Rossii, 757; Fl. Yugo-Vost. VI, 49.—*G. Amarella* L. Sp. pl. (1753) 230, p.p.—*G. Amarella* var. *lingulata* Kryl. Fl. Zap. Sib. IX (1937) 2172.—*G. Amarella* δ . *livonica* Ldb. Fl. Ross. III (1847-1851) 53; Shmal'g. Fl. II, 214.—
606 *G. livonica* Eschscholtz in Griseb. Gentian. (1839) 241.—*G. pratensis* Froehl. Gent. (1796) 88, p.p.—Ecs.: GRF, No. 1453.

Biennial, glabrous, green; stems slender, erect, 14-30 cm long, moderately branched from base or merely from upper part, with 4 or 5 internodes, of these the lowest short, the second and third very long; rosulate leaves commonly persistent in flower, obovate, obtuse, 7-10 mm long; cauline leaves much shorter than internodes, broadly ovate to ovate, often subcordate at base, 7-15 (20) mm long, 5-10 mm broad, the lower obtusish, the upper acute; flowers 5-merous, numerous; calyx 8-11 mm long; calyx teeth slightly unequal, lance-linear, half as long again as the tube; corolla tubular, dingy violet or whitish, (10) 12-16 (20) mm long; corolla lobes oblong-oval, obtuse, 4-5 mm long; ovary and capsule sessile or borne on a very short stipe (var. *livonica* (Eschsch.) m.). May-June.

Meadows and banks.—European part: Kar.-Lapl, Dv.-Pech., V.-Ka., Balt., Lad.-Ilm., U.V.; U. Dnp., V.-Don; Caucasus: Dag., E. Transc.; W. Siberia: Ob, Irt., Alt.; E. Siberia: Yen.; Soviet Central Asia: Balkh. **Gen. distr.**: Scand., Centr. and Atl. Eur. Described from Sweden. Type in Sweden.

76. **G. axillaris** (F.M. Schmidt) Murb. in Acta horti Bergiani, II, No. 3 (1892) 20; Syreishch., Ill. Fl. Mosk. gub. III, 381.—*Hippion axillare* F.M. Schmidt, Fl. Boem. cent. II (1793) 29.—*G. Amarella* L. Sp. pl. (1753) 230, p.p.; M.B. Fl. taur.-cauc. I, 198; Kuzn. in Mat. Fl. Kavk. IV, 370, p.p.; Kryl. Fl. Alt. III, 835.—*G. Amarella* γ . *axillaris* Ldb.

Fl. Ross. III (1847-1851) 53; Fedch. and Fler. Fl. Evrop. Rossii, 757; Fl. Yugo-Vost. VI, 49; Kryl. Fl. Zap. Sib. IX, 2172; Maevsk. Fl. ed. 7, 575.— *G. Amarella* β . *pyramidalis* Ldb. l.c.— *G. pratensis* Froel. *Gentian.* (1796) 88, p.p.— Ic.: Rchb. Pl. crit. tab. 250; Wettst. Monogr. tab. III, f. 4; tab. IV, f. 16.— Exs.: Fl. exs. Austro-Hung. No. 2194.

Biennial, glabrous, green; stem erect, branched, rarely simple; (5) 20-40 (60) cm long, with 6-12 internodes, of these the second and third as long as or just slightly longer than the others; rosulate leaves spatulate, narrowed into a petiole, not attenuate toward apex, obtuse or almost round-tipped, commonly deciduous in flower; lower and middle cauline leaves ovate-lanceolate to lanceolate, acute, 20-30 mm long, 5-10 mm broad, as long as or longer than internodes; upper leaves lanceolate, acute; flowers 5-merous, commonly numerous; calyx 7-10 mm long; calyx teeth slightly unequal, lance-linear to linear, acute, $1\frac{1}{2}$ times to twice the length of tube, the sinuses mostly obtuse, sometimes rounded; corolla tubular, 607 dingy-violet or whitish, (9) 12-16 (20) mm long; corolla lobes oblong, subacute, 4-5 mm long; ovary and capsule sessile. July-October.

Meadows and banks.— European part: Balt., Dv.-Pech., Lad.-Ilm., V-Ka., U. Dnp., M. Dnp., U. V., V.-Don, Crim.; Caucasus: Cisc., E. Transc., W. Siberia: Ob, Irt., Alt.; E. Siberia: Yen.; Soviet Central Asia: Ar.-Casp., Balkh. **Gen. distr.:** Scand., Centr. and Alt. Eur. Described from Bohemia. Type in Berlin?

Note. *G. lingulata* and *G. axillaris* represent seasonal species of the spring — summer and fall periods, respectively.

77. ***G. plebeja*** Cham. et Schlecht. in Linnaea, I (1826) 181.

Biennial, glabrous, green; stem erect, simple or branched chiefly from base, 10-30 cm long, with 3-6 (7) internodes; rosulate leaves commonly persistent in flower, spatulate, narrowed at base into petiole, obtusely round-tipped, 10-20 (25) cm long, 3-6 mm broad; lower and middle cauline leaves oblong to oblong-lanceolate, obtuse, (10) 15-20 mm long, 3-5 (6) mm broad; upper leaves lanceolate, subacute; flowers 5-merous; calyx (7) 9-12 mm long, the tube 1-2 (3) mm long, sometimes cut to base; calyx teeth 6-10 mm long, unequal, two narrowly lanceolate, broader and longer, the others linear, shorter, all acute, the sinuses acute or obtusish; corolla tubular, dingy violet or whitish, rarely pale yellow (var. *haleniaeformis* Sukatshev), (9) 10-13 (15) mm long, (3) 4-5 mm broad at throat; corolla lobes oval-oblong, acute, 4-5 (6) mm long; ovary and capsule sessile. June-August.

Meadows, steppe slopes, coppices, and pebbles.— E. Siberia: Yen., Ang.-Say., Lena-Kol.; Far East: Okh. **Gen. distr.:** Bering. Described from Unalaska Island. Type in Berlin (?).

78. ***G. acuta*** Mchx. Fl. bor.-amer. I (1803) 177.— *G. ajanensis* Murb. in Acta horti Bergiani, II, No. 3 (1892) 24.— (?) *G. setiflora* Bge. in Mem. Soc. Mat. Mosc. VII (1829) 242, tab. IX, f. 4.

Biennial, glabrous, green; stem erect, simple or branched, with upright appressed branches, (15) 20-40 (60) cm long, with (4) 6-10 internodes; rosulate leaves commonly deciduous in flower, spatulate-oblong, tapering at base into petiole, attenuate toward apex, obtuse; lower and middle cauline

leaves lanceolate; subobtusate, 15-30 mm long, 6-8 mm broad; upper leaves lanceolate, acute; flowers 5-merous, rarely 4-merous; calyx 7-10 mm long; calyx tube 2 (3) mm long, sometimes the calyx cut to base; calyx teeth 6-9 mm long, unequal, two longer, the others short, narrowly lanceolate to linear, acuminate, the sinuses obtusish or acute; corolla tubular, dingy-violet or pale yellow, 9-13 mm long, 3-4 mm broad at throat; corolla lobes oblong-oval, acute to obtusish, 3-4 mm long; ovary and capsule sessile. July-September.

Meadows, steppe slopes, and scrub. — E. Siberia: Yen., Ang.-Say., Lena-Kol.; Far East: Okh. **Gen. distr.:** Dzu.-Kash., Mong., Tib., N. Am. Described from N. America (mountains of Carolina and Canada). Type in New York.

Note. *S. plebeja* and *G. acuta* represent seasonal species of the summer and autumn period, respectively.

79. ***G. paludicola*** Koidzumi in Sugawara, Pl. of Saghalin (1937) 269. — Ic.: ibid. Mountain Vegetation of S. Sakhalin (in Japanese) (1941), Plate 25.

Annual and biennial, glabrous, green; stem erect, commonly branched from base, with upright branches, 10-20 cm long, with 3 or 4 internodes; rosulate leaves persistent in flower, lanceolate to ovate-lanceolate, acute, 8-15 mm long, 3-6 mm broad; cauline leaves lanceolate, acute, 10-20 (25) mm long, 3-8 mm broad, shorter than internodes; flowers 5-merous, calyx ca. 10 mm long; calyx teeth slightly unequal, two broader, the others narrower, oblong or linear, acute, $1\frac{1}{2}$ times to twice the length of tube, the sinuses obtuse; corolla tubular, with a distinct limb, pale violet, 20-30 mm long; corolla lobes ovate, acute, (4) 5-8 mm long; ovary and capsule sessile. July (Plate XXXI, Figure 3).

Wet places. — Far East: Sakh. Endemic. Described from Sakhalin Island. Type in Tokyo.

Section 10. **ARCTOPHILA** Griseb. Gentian. (1839) 250. — Calyx unsplit; corolla tubular-infundibular, limbed, not fimbriate in throat; style absent; capsule sessile or subsessile; seeds wingless; annuals or biennials.

1. Calyx segments unequal, two longer and broader, the other two narrowly linear and much shorter, the sinuses between the teeth acute; corolla 18-20 mm long; flowers as a rule 4-merous. 80. ***G. propinqua*** Richards.

+ Calyx segments equal or nearly so; corolla smaller; flowers as a rule 5-merous 2.

2. Corolla lobes sky-blue, muticous; calyx segments subequal, black-rimmed, the sinuses acute. 87. ***G. azurea*** Bge.

+ Corolla violet-bluish, yellowish or white, the lobes commonly mucronate; calyx segments slightly unequal, not rimmed, the sinuses obtuse 3.

609 3. Corolla larger, (9) 10-13 (19) mm long; calyx segments commonly reflexed, uncinately-tipped; plants relatively tall. 81. ***G. turkestanorum*** Gand.

+ Corolla smaller; calyx teeth commonly erect 4.

4. Flowers few, not enveloped in upper leaves; corolla 6 mm long, azure, lobed to the middle; plants 1-4 cm tall 86. ***G. pamirica*** Grossh.

- + Flowers commonly numerous, the terminal ones enveloped in upper leaves; corolla lobed to one third or rarely to the middle; plants larger. 5.
- 5. Corolla smaller, (5) 6-8 (10) mm long. 6.
- + Corolla larger, 8-11 mm long. 7.
- 6. Corolla 7-8 mm long; stem simple or weakly branched from base. 84. *G. aurea* L.
- + Corolla (5) 6-7 mm long; stem as a rule branched from base and from lower part, the branches arcuately ascending 85. *G. sibirica* (Kusn.) Grossh.
- 7. Corolla lobes obsolescently mucronate or muticous; stems commonly slightly branched from base; flowers crowded at the ends of stems; corolla (8) 9-11 (13) mm long. 82. *G. atrata* Bge.
- + Corolla lobes distinctly mucronate; stem commonly strongly branched; corolla 8-10 mm long 83. *G. umbellata* M.B.

80. *G. propinqua* Richards. in Franklin, Narrative of a Journey (1823) 734; Ldb. Fl. Ross. III, 57.—*G. Rurikiana* Cham. et Schlecht. in Linnaea, I (1826) 176.

Biennial, glabrous, green; stem commonly with fasciculate upright branches arising from base, rarely simple, (4) 10-20 (25) cm long; rosulate leaves oblong-oblongeolate or oblong-obovate, acute, 12-20 (22) mm long, 3-5 mm broad; cauline leaves ovate or lanceolate, acute, 14-18 mm long, 3-6 mm broad; flowers as a rule 4-merous, usually numerous at the end of stem and on branches; calyx (7) 9-11 mm long, with a very short tube; two teeth acuminate, 1.5-2 (3) mm broad, about twice the length of the other two, narrowly lanceolate to nearly subulate; corolla tubular-infundibular, 17-18 (20) mm long, 4-5 mm broad at throat, pale violet-azure, half as long again as the calyx; corolla lobes oval, 4-5 mm long, acute, mucronate; capsule linear-oblong, stipitate; seeds 0.3-0.5 mm long, oval, brown, smooth. July-August.

Tundra.—Arctic: Chuk. (Lavrentiya Bay). **Gen. distr.:** N. Am. Described from Canada. Type in London.

610 81. *G. turkestanorum* Gand. in Bull. Soc. Bot. France, LXV (1918) 60.—*G. aurea* Ldb. Fl. Ross. IV (1847-1851) 58, p.p. non L.; Fedch. Rast. Turk. 649.—*G. aurea* var. *glomerata* Kusn. in Mat. Fl. Kavk. IV, 1 (1904) 388, non Rgl.—*G. aurea* β . *umbellata* Kryl. Fl. Alt. III (1904) 840.—*G. umbellata* var. *glomerata* Kryl. Fl. Zap. Sib. IX (1937) 2177, non Rgl.

Annual or biennial, glabrous, green; stems simple or with few short branches from base, sometimes weakly branched in upper part, (10) 30-40 (60) cm long, rarely 3-6 cm long and few-flowered (f. *pumila* Grossh.); rosulate leaves oblong-oblongeolate, rarely obovate, narrowed into petiole, obtusely round-tipped, (10) 20-30 (35) mm long, 3-5-nerved; cauline leaves lanceolate to ovate-lanceolate, (20) 25-40 (50) mm long, (6) 10-15 mm broad, obtuse to subacute, rarely acute; flowers 5-merous, crossed at the ends of stem and branches, short-pedicelled; calyx 8-11 mm long; calyx teeth two to three times the length of tube, unequal, two longer and obtuse, the others narrower, all narrowly linear-subulate, commonly enlarged in upper part, mostly reflexed and subuncinate-tipped, rarely erect, the

sinuses obtuse; corolla tubular, pale azure or more often yellowish, (9) 11-13 (19) mm long, slightly exceeding the calyx; corolla lobes oblong-oval, half the length of to (rarely) nearly equaling the tube, 3-5 mm long, slenderly mucronate; capsule short-stipitate, oblong-ovaloid; seeds small, rounded-ovaloid, brown, smooth. July-August.

Meadows, wet places and near streams in the upper mountain zone. — W. Siberia: Alt. (S.); Soviet Central Asia: Balkh., Dzu.-Tarb., Syr D., T. Sh. **Gen. distr.**: Dzu.-Kash., Mong. Described from Turkestan. Type in Paris.

82. **G. atrata** Bge. in DC. Prodr. IX (1845) 98; Ldb. Fl. Ross. III, 55. — *G. tenuis* Ldb. l. c. 57, non Griseb. — *G. aurea* γ . *tenuis* Kryl. Fl. Alt. III (1904) 840. — *G. aggregata* Bge. ex Kryl. Fl. Zap. Sib. IX (1937) 2177.

Annual or biennial, glabrous, green; stems (4) 10-20 cm long, simple, rarely with few short branches from base; rosulate leaves oblong-obovate to oblong-oblancheolate, narrowed into petiole, obtusely round-tipped, 10-20 (30) mm long; cauline leaves lanceolate, (15) 20-25 (30) mm long, (5) 6-10 mm broad, the lower obtuse, the upper acute; flowers mostly 4-merous, rarely 5-merous, short-pedicel, gathered in dense clusters at the end of stem and in axils of cauline leaves; calyx 6-9 mm long, parted to somewhat below the middle; calyx teeth half as long again as the tube, 611 slightly unequal, narrowly linear-subulate, acuminate, scarcely enlarged in upper part, scabrous-margined, the sinuses obtuse; corolla tubular, azure or yellowish, (8) 9-11 (13) mm long, slightly exceeding the calyx; corolla lobes oval-oblong, obtuse, minutely mucronulate or muticous; capsule sessile or borne on a very short stipe, brown, smooth. July-August.

Meadows, near streams, in upper mountain zone. — W. Siberia: Alt. Endemic. Described from Altai. Type in Leningrad.

83. **G. umbellata** M.B. Fl. taur.-cauc. III (1819) 188; Grossg. Fl. Kavk. III, 231. — *G. aurea* Boiss. Fl. or. IV (1879) 71, non L.; Lipskii, Fl. Kavk. 391. — *G. aurea* β . *umbellata* Kuhn. in Mat. Fl. Kavk. IV (1904) 384.

Annual or biennial, glabrous, green; stems (4) 10-20 (30) cm long, commonly with few long upright branches from base; rosulate leaves obovate-lanceolate or spatulate, narrowed into petiole, obtuse or rounded-obtuse, 10-25 mm long, 6-10 mm broad; cauline leaves oblong-ovate to oblong-lanceolate, obtuse or acute, 10-25 mm long, 5-12 (15) mm broad, the uppermost acute, enveloping the flowers; flowers as a rule 5-merous; calyx 5-9 mm long, deeply parted; calyx teeth 3-4 times the length of tube, slightly unequal, one somewhat broader and longer, the others narrower and shorter, all narrowly linear, acuminate, enlarged in upper part, scabrous-margined, the sinuses obtuse; corolla tubular, azure or yellowish, rarely nearly white, 8-10 mm long, somewhat exceeding the calyx; corolla lobes triangular-ovate, about half the length of tube, 2-3 (4) mm long, slenderly mucronulate; capsule sessile, oblong-ovate; seeds very small, 0.2-0.3 mm long, globose, brown, smooth. July-August.

Meadows, wet places in the subalpine and alpine zones. — Caucasus: Cisc., Dag., E. and S. Transc., Tal. Described from Khinaluga. Type in Leningrad.

84. *G. aurea* L. Sp. pl. ed. II (1762) 331.—*G. aurea* var. *typica* Kusn. in Mat. Fl. Kavk. IV, 1 (1904) 388.—*G. aurea* α . *borealis* Kryl. Fl. Alt. III (1904) 840.—*G. aurea* var. *involucrata* (Rottb.) Kusn. l.c. 388.

Annual or biennial, glabrous, green; stems (5) 8-15 (20) cm long, commonly with few upright branches from base; rosulate leaves spatulate, tapering into petiole, round-tipped, 10-15 mm long, 3-5 mm broad; cauline leaves oblong-ovate to broadly ovate, the lower obtuse or round-tipped, 612 (10) 15-20 mm long, 8-12 (15) mm broad, the uppermost acute, the terminal enveloping the flower; lower flowers long-pedicceled, the upper short-pedicceled, 5-merous, rarely 4-merous; calyx 6-7 mm long, deeply parted; calyx teeth 3-4 times the length of tube, unequal, one somewhat broader, the others narrower, linear, enlarged in upper part, acute or acuminate, the margin smooth or scaberulous, the sinuses obtuse; corolla tubular, pale yellow or azure (f. *involucra* Rottb.) Kusn.), 7-8 mm long, slightly exceeding the calyx; corolla lobes equaling the tube, oblong-oval, 3-4 mm long, with a slender mucro 0.5 mm long; capsule sessile, ovoid-oblong. July-August.

Meadows, wet places, and sea coast. Arctic: Arc. Eur.; European part: Kar.-Lap. **Gen. distr.:** Scand. Described from northern part of Scandinavian Peninsula. Type in London.

85. *G. sibirica* (Kusn.) Grossh. comb. n.—*G. aurea* Ldb. Fl. Ross. III (1847-1851) 57, p.p.—*G. aurea* var. *sibirica* Kusn. in Mat. Fl. Kavk. IV, 1 (1904) 388.

Annual or biennial, glabrous, green; stems (5) 10-20 (30) cm long, with long slender somewhat arcuately ascending branches from base, sometimes with similar branches from the axils of the lowest pair of cauline leaves; rosulate leaves oblong-obovate, 10-20 mm long, 5-6 mm broad, narrowed into petiole, obtusely round-tipped; cauline leaves oval-oblong, 15-20 (35) mm long, 7-9 mm broad, the lower obtuse, the upper acute; flowers 4- or 5-merous, at the end of stem more or less crowded, on the branches in loose clusters, sometimes on pedicels to 4 cm long; calyx 4-6 mm long, deeply parted, sometimes nearly to base; calyx teeth somewhat unequal, linear-subulate, acute, commonly erect; corolla tubular, pale azure or yellowish, sometimes nearly white, (5) 6-7 (10) mm long, slightly exceeding the calyx; corolla lobes oval-triangular, ca. 2 mm long, distinctly and slenderly mucronate; capsule oblong-oval, short-stipitate or subsessile; seeds very small, subspherical-ovaloid, smooth. July-September.

Wet meadows and near streams in the upper mountain zone.—W. Siberia: Alt. Endemic. Described from Altai. Type in Leningrad.

86. *G. pamirica* Grossh. sp. n. in Addenda XVII, 751.

Annual or biennial, glabrous, green; stems 1-4 cm long, simple or fasciculately branched from base, the branches arcuately ascending; rosulate leaves oblanceolate-oblong, narrowed at base, obtusely round-tipped, 6-9 mm long, ca. 2 mm broad; cauline leaves 1 or 2 pairs, ovate to lanceolate, subobtuse, 6-8 mm long, 3-4 mm broad; flowers 5-merous, 613 few, borne on long glabrous pedicels, not enveloped by upper leaves; calyx parted nearly to base, 3-4 mm long; calyx teeth slightly unequal, linear, enlarged in upper part, acute, sometimes uncinately acuminate; corolla

tubular-infundibular, azure-violet, ca. 6 mm long, 2-3 mm broad at throat; corolla lobes oblong-oval, the length of tube, obtuse but terminating in a black mucro; anthers blue; capsule oblong-ovaloid, sessile, equaling or scarcely exceeding the corolla; seeds very small, 0.1-0.2 mm long, subglobose, brown, smooth. July (Plate XXXII, Figure 3).

Meadows in the alpine zone. — Soviet Central Asia: Pam.-Al. (Pamir). Endemic. Described from the Gunt River. Type in Leningrad.

87. *G. azurea* Bge. in Mem. Soc. Nat. Mosc. VII (1829) 230; Ldb. Fl. Ross. III, 57; Kryl. Fl. Alt. III, 838; Kryl. Fl. Zap. Sib., IX, 2176. — *G. marginata* Turcz. ex Besser in Flora, XVII (1834) I Beibl. 19 non Griseb. neque Wallich et Clarke. — Ic.: Bge. ibid. tab. 10, f. 3.

Annual, glabrous, green; stems 3-8 (10) cm long, branched from base, the branches divergent and arcuately ascending, about as long as the stem; lower leaves few, indistinctly rosulate, small, obovate, obtuse; leaves of stem and branches oblong-elliptic to oblong, obtuse, (3) 4-6 (12) mm long, 2-3 (5) mm broad; flowers 5-merous; calyx 4-5 mm long; calyx teeth subequal, twice the length of tube, ovate-lanceolate to lanceolate, acute, narrowly brown-rimmed on the margin, the sinuses acute; corolla tubular, 8-9 mm long, the tube whitish; corolla lobes sky-blue, oblong-ovate, obtuse, muticous, 2-3 mm long, one third to half the length of tube, more or less spreading in anthesis; ovary sessile; capsule oblong; seeds very small, globose, brownish, smooth. July-August.

Meadows, wet places, stony tundra, and taluses in the high-mountain zone. — W. Siberia: Alt.; E. Siberia: Ang.-Say., Dau.; Soviet Central Asia: Dzu.-Tarb., T. Sh. **Gen. distr.:** Dzu.-Kash. Described from Siberia. Type in Leningrad.

Section 11. **COMASTOMA** Wettst. in Oesterr. Bot. Zeitschr. XLVI (1896) 174. — Calyx 4- or 5-parted, with a short tube; corolla infundibular or campanulate, 4- or 5-parted, with one or two fimbriate scales at the base of each lobe; style absent; stigma very short; seeds wingless; flowers commonly long-pediceled; annuals or biennials.

1. Flowers large, 14-17 mm long 2.
- + Flowers smaller, 6-10 mm long (in anthesis) 3.
- 614 2. Stems abbreviated, with numerous ascending branches from base; corolla dark violet-blue, relatively broad, the lobes strongly reflexed. 89. *G. falcata* Turcz.
- + Stems well developed, branched from the middle or higher up; corolla bluish-violet, with pale tube, relatively narrow, with little reflexed lobes 88. *G. pulmonaria* Turcz.
3. Flowers very small, 5-6 mm long; corolla yellow; plants 1-3 cm long, with numerous spreading ascending branches 93. *G. pygmaea* Rgl. et Schmalh.
- + Flowers large; corolla differently colored; flowers larger 4.
4. Stems loosely branched, mostly throughout their length, weak, the long slender flexuous branches bearing flowers at the end and in leaf axils. 90. *G. dichotoma* Pall.
- + Stems fasciculately branched from base, the branches arcuately ascending 5.

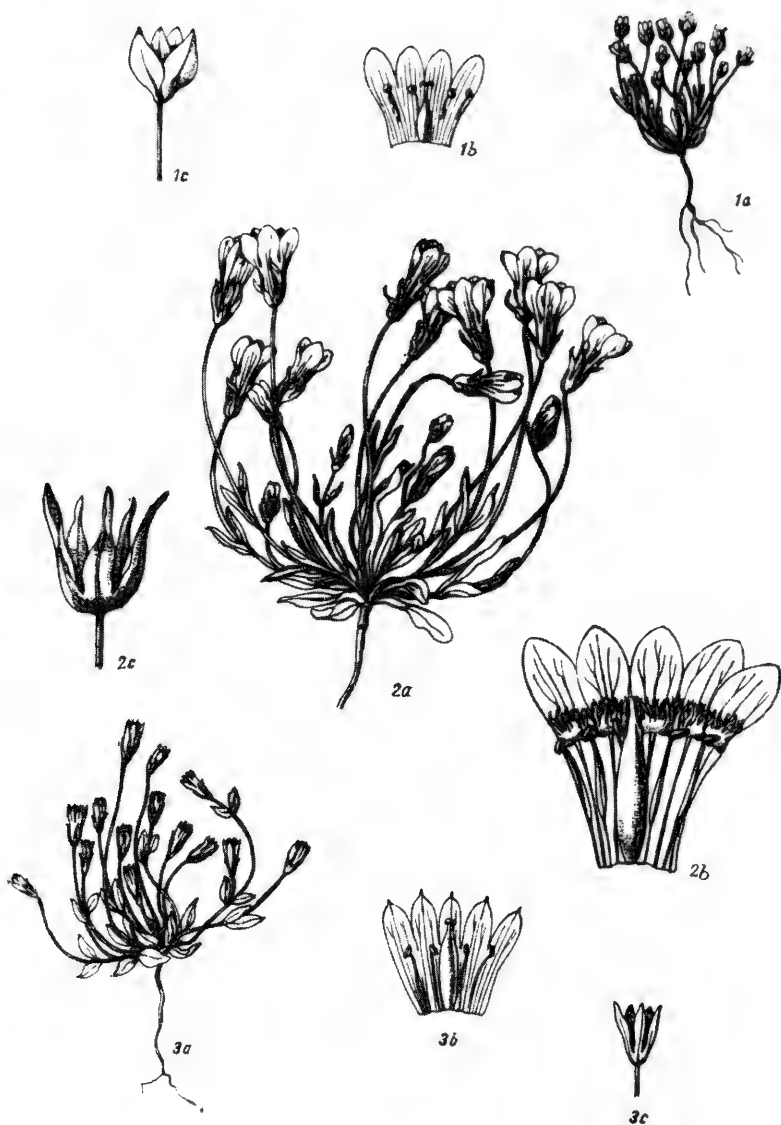


Plate XXXII

1a, 1b, 1c. *Gentiana pygmaea* Rgl. et Schmalh.— 2a, 2b, 2c. *G. falcata* Turcz.— 3a, 3b, 3c. *G. pamirica* Grossh.

5. Plants (2) 4-8 (15) cm tall, calyx 4-5 mm long at anthesis; corolla 6-10 mm long, in fruit 10-18 mm long. 91. *G. tenella* Rottb.
 + Plants 2-5 (8) cm tall; calyx 3-4 mm long at anthesis; corolla 4-5 mm long, 8-12 mm long in fruit. 92. *G. Dechyana* Somm. et Lév.
 88. *G. pulmonaria* Turcz. in Flora (1834) I Beibl. 19 (nomen); Bull. Soc. Nat. Mosc. XXII (1849) 317 (descriptio); Ldb. Fl. Ross. III, 55. — Exs.: GRF, No. 1378.

Biennial, glabrous, darkish green; stems well developed, (7) 10-16 (20) cm long, commonly branched from the middle; branches 2-7, slender, sometimes with branches of second order; rosulate leaves commonly deciduous in flower, obovate-lanceolate, narrowed into petiole, rounded-obtuse, 8-15 mm long, 3-4 mm broad; leaves on main stem relatively large, sessile, oblong-elliptic or oval, rounded-obtuse, the upper ones subacute, (12) 15-20 (25) mm long, 7-10 mm broad; leaves on branches much smaller; flowers 5-merous; borne on pedicels (0.5) 1-4 cm long; calyx parted nearly to base, (4) 5-7 mm long; calyx segments lanceolate, unequal, mostly erect, rarely some reflexed; corolla tubular, violet-azure, with paler tube, (13) 14-17 mm long, (3) 4-5 mm broad at throat, twice to three times the length of calyx; corolla lobes half the length of tube, slightly reflexed, oval-oblong, narrowed toward apex, acute, ca. 4 mm long; crown profusely fringed; capsule sessile, oblong, narrowed at the top; seeds small, smooth. July-August.

Meadows, wet places, stony slopes, in the upper mountain zone. — E. Siberia: Ang.-Say., Dau. Endemic (?). Described from Transbaikalia from Tuchulta River. Type in Leningrad.

89. *G. falcata* Turcz. Cat. Baikal. No. 783 (1837) (nomen); Bull. Soc. Nat. Mosc. XV (1842) 404 (descriptio); Ldb. Fl. Ross. III, 55; Kryl. Fl. Alt. III, 837; Fl. Zap. Sib. IX, 2174. — Exs.: GRF, No. 1337.

Annual, glabrous, dark green, 5-12 (17) cm long, rarely 1-3 cm long and 1-3-flowered (f. *pusilla* Grossh.); stem abbreviated, commonly strongly branched from base, the branches terminating in a flower; rosulate leaves numerous, obovate, narrowed at base into petiole, obtuse, 8-15 mm long, 2-3 (4) mm broad; cauline leaves sessile, oval to oval-oblong, subobtuse to acute; pedicels 1-4 (7) cm long; flowers 5-merous, broadly campanulate, blackish-green, parted nearly to base, 7-11 mm long; calyx segments lanceolate from broad base, often falcately recurved, one or two segments usually narrow, linear; corolla tubular-infundibular, dark violet, (8) 14-18 (24) mm long, (4) 5-7 mm broad at throat, twice the length of calyx; corolla lobes about as long as to slightly longer than the tube, more or less reflexed, oblong-obovate, obtuse, 5-7 mm long, the crown profusely fimbriate; capsule sessile, oblong-ovaloid, narrowed upward, slightly exceeding the corolla; seeds small, rounded-ovaloid, dark violet, smooth. July-August (Plate XXXII, Figure 2).

Meadows and banks of stream in the subalpine and alpine zones. — W. Siberia: Alt.; E. Siberia: Ang.-Say., Dau.; Soviet Central Asia: T.Sh., Pam.-Al. Described from the mountain ranges adjacent to Lake Baikal. Type in Moscow; cotype in Leningrad.

90. *G. dichotoma* Pall. Fl. Ross. II (1788) 110. — *G. tenella* Ldb. Fl. Ross. III, 56, p.p. non Rottb. — *G. tristriata* Turcz. in Flora (1834) I Beibl. 19. — Exs.: GRF, No. 1336.

Annual, glabrous, green; stems 8-15 (20) cm long, weak, ascending, branched throughout its length; branches long, slender, flexuous, usually bearing few branches of second order; basal leaves commonly early

deciduous, obovate-lanceolate, narrowed toward base, obtusely round-tipped, 5-10 mm long, 3-4 mm broad; stem and branch leaves fairly numerous, oblongly obovate-lanceolate to oblong-oval; basal and cauline leaves narrowed toward base, obtuse, the uppermost scarcely narrowed toward base, subacute, (5) 7-10 (12) mm long, 3-4 mm broad; flowers long-pedicelled, 4-merous; calyx parted nearly to base, 4-6 mm long, in fruit 8-10 mm long, the segments ovate-lanceolate acutish; corolla tubular, azure, 6-7 mm long, elongating in fruit to 10-15 mm; corolla lobes oblong-oval, half the length of tube; capsule sessile, oblong-ovaloid, narrowed upward, slightly exceeding the corolla; seeds very small, 0.1 mm long, subglobose-ovaloid, brown, smooth. August.

Gravelly and wet places in the alpine zone. — W. Siberia: Alt.; E. Siberia: all regions; Far East: Kamch. Endemic. Described from Siberia. Type in Leningrad.

91. **G. tenella** Rottb. Act. Hafn. X (1770) 436; Ldb. Fl. Ross. III, 56; Fedch. and Fler. Fl. Evrop. Rossii, 757; Kom. Fl. Kamch. III, 34. — **G. tenella** α . *tetramera* Turcz. and β . *pentamera* Turcz. ex. Kryl. Fl. Alt. III (1904) 837; Fl. Zap. Sib. IX, 2175. — **G. chrysoneura** Exstam et Murb. in Oesterr. Bot. Zeitschr. XLVIII (1898) 124. — Ic.: Rottb. l.c. tab. 2. — Exs.: GRF, No. 1336.

Annual, glabrous, green; stems (2) 4-8 (15) cm long or rarely 1-2 cm (var. *chrysoneura* (Exstam et Murb.) Grossh.), fasciculate branched at base, the ascending and upright branches terminating in a long-pedicelled flower, rarely the stem simple monanthous; rosulate leaves oblong-ob lanceolate, narrowed into petiole, obtusely round-tipped, 6-12 mm long, 2-4 mm broad; cauline leaves 1-4 pairs, oblong-elliptic, 5-10 (18) mm long, (2) 3-5 (6) mm broad, the lower obtuse, the upper subacute; flowers 5-merous (f. *pentamera* Turcz.), rarely 4-merous (f. *tetramera* Turcz.), long-pedicelled or rarely with pedicels only 1-6 mm long (var. *chrysoneura* (Exstam et Murb.) Grossh.); flowering calyx 4-5 mm long, parted nearly to base, the segments unequal, one ovate-lanceolate, the others lanceolate, acutish; fruiting calyx 6-8 mm long, half the length of corolla, rarely 9-10 (15) mm long and equaling or exceeding the calyx (var. *megacalycina* Grossh.); corolla tubular, azure, orange-nerved, at anthesis 6-10 mm long, in fruit 10-18 mm long; corolla lobes oblong-ovate, obtuse or acutish, half as long as the tube; capsule oblong-ovaloid, equaling or slightly exceeding the corolla; seeds very small, subglobose-ovaloid, brown, smooth. June-August.

Meadows in the alpine zone. — Arctic: Arc. Eur. (common form), Nov. Z. (only var. *chrysoneura*), Arc., Sib., Chuk., An. (chiefly var. *megacalycina*); European part: Kar.-Lap., Dv.-Pech., U. Dns. (Carpathians); W. Siberia: Alt.; E. Siberia: Yen., Lena-Kol. (chiefly var. *megacalycina*), Ang.-Say., Dau; Far East: Kam.; Soviet Central Asia: Balkh., Dzu.-Tarb., T. Sh. **Gen. distr.**: Scand., Centr. Eur. Described from mountains of W. Europe. Type in Copenhagen.

92. **G. Dechyana** Somm. et Lev. in Byll. della Soc. bot. ital. (1896) 77; Lipskii, Fl. Kavk. 390; Grossg. Fl. Kavk. III, 229. — **G. tenella** var. *Dechyana* Kusn. in Mat. Fl. Kavk. IV, 1 (1904) 390. — Ic.: Somm. et Lev. l.c. tab. XVII.

Annual, glabrous, green; stems 2-5 (8) cm long, fasciculate branched at base, the ascending branches terminating in a long-pedicelled flower, rarely stem simple monanthous (f. *perpusilla* Grossh.); rosulate leaves

oblong-oblongeolate, narrowed into petiole, obtusely round-tipped, 8-10 mm long, 2-3 mm broad; cauline leaves 1 or 2 pairs, oval to oblong-oval, 5-10 (10) mm long, 2-4 (5) mm broad, the lower obtuse, the upper sub-acute; flowers 4-merous; flowering calyx 3-4 mm long, parted nearly to base, two segments broader and ovate-lanceolate, the other two narrower linear, all acutish; fruiting calyx 7-8 mm long; corolla tubular-campanulate, azure, orange-nerved, 4-5 mm long, elongating in fruit to 7-8 mm; corolla lobes broadly ovate, round-tipped, half as long as the tube; capsule sessile, oblong-ovaloid, narrowed upward, equaling or scarcely exceeding the corolla; seeds very small, ovaloid, dark brown, smooth. July-September.

Alpine meadows.—Caucasus: Cisc., Dag., W. Transc. Endemic. Described from Mt. El'brus (Kyukyurtlyu). Type in Florence.

93. **G. pygmaea** Rgl. et Schmalh. in Izv. Obshch. lyubit. estestvozn., antrop. i etnogr. XXXIV, 2 (1882) 54.

Annual, glabrous, pale green, 1-3 cm tall; stems branched at base or in lower part, the numerous spreading ascending branches terminating in a flower; rosulate leaves oblanceolate, narrowed into a slender petiole, rounded-rosulate, (2) 3-6 mm long, 2 mm broad; cauline leaves one or rarely 2 pairs, narrowly lanceolate to linear, acute, 3-6 mm long; flowers 4-merous, long-pedicelled; calyx segments oblong-ovate to oblong-lanceolate, acutish; corolla tubular, pale yellow, 5-6 (7) mm long, half as long again as the calyx; corolla lobes oval, obtuse, half as long as the tube; capsule sessile, oblong-ovaloid, narrowed upward, acute, slightly exceeding the corolla; seeds very small, 0.2-0.3 mm long, ovaloid, brown, smooth. July-August (Plate XXXII, Figure 1).

620 Stony places and pebbles in the alpine zone.—Soviet Central Asia: Pam. Al., T. Sh. Endemic. Described from Kchi-Alai. Type in Leningrad.

Genus 1155. **LOMATOGONIUM*** A. BR.**

A. Br. in Flora, I, 13 (1830) 221; Fernald in Rhodora, XXI (1919) 193.—Pleurogyne Eschsch, pro syn. sect. *Gentiana* in Linnaea, I (1826) 187.

Flowers 5-merous or very rarely isolated flowers 4-merous; calyx and corolla parted nearly to base; corolla rotate; base of corolla lobes, at the point of insertion of stamens, furnished with small tubular-cupuliform laminate-margined nectaries; stamens with pendent anthers; ovary sessile; stigma sessile, decurrent along the ovary sutures nearly to base as roughened grooved stripes; capsule unilocular, 2-valved, with marginal placentae; seeds small, ovaloid; small annuals.

The genus contains 3 or 4 species, distributed through high mountains of Eurasia, mountainous areas of N. Asia, and arctic regions of America and W. Europe.

1. Leaves ovate to oblong-ovate; calyx segments oblong-ovate, half to two-thirds the length of corolla 1. **L. carinthiacum** (Wulfen.) A. Br.
- + Leaves linear-lanceolate to linear; calyx segments linear, about equaling the corolla 2. **L. rotatum** (L.) Fries.

* From Greek *loma* = margin, scar, and *goun* = fruit, referring to the decurrent stigmas which join the carpels like seams.

** Arranged by E.G. Bobrov.

1. *L. carinthiacum* (Wulfen.) A. Br. in Flora, XIII (1830) 221; Grossg. Fl. Kavk. III, 231; Kryl. Fl. Zap. Sib. IX, 2195.—*Swertia carinthiaca* Wulfen. in Jacq. Misc. II (1781) 53.—*S. sulcata* Rottb. in Kiob. Selsk. Skr. X (1770) 438.—*Gentiana rotata* Willd. Sp. pl. I (1797) 135; M. B. Fl. taur.-cauc. I, 199.—*G. Stelleriana* Cham. et Schl. in Linnaea, I (1826) 188, p.p.—*Pleurogyne carinthiaca* (Wulfen.) Griseb. Gentian. (1839) 310; Ldb. Fl. Ross. III, 71; Boiss. Fl. or. IV, 77; Kuzn. in Mat. Fl. Kavk. IV, 1, 395; Kom. Fl. Kamch. III, 37.—Ic.: Pall. Ic. Fl. Ross. II, tab. XC, f. 3.—Exs.: GRF, No. 471; Dörf. Herb. norm. No. 3785; Fl. exs. Austro-Hung. No. 3737.

Annual, glabrous, green; root slender; stems usually numerous from base, slender, more or less secondarily branched, 5-10 (15) cm long; basal rosette none; leaves small; basal leaves obovate, strongly narrowed toward base, obtuse; cauline leaves ovate, elliptic or oblong, obtuse, 5-10 mm long, 3-5 (6) mm broad; pedicels long, slender; calyx 3-5 mm long, elongating in fruit to 8 mm long; calyx segments ovate, acute, half the length of corolla; corolla 7-8 mm long, elongating in fruit to 10-11 mm, pale azure, olivaceous-blue outside, the lobes elliptic acute; nectariferous pits light-colored, fringed; ovary obtuse, orange; capsule ca. 15 mm long; seeds numerous, ca. 0.5 mm long, smooth. August-October (Plate XXXIII, Figure 2).

Alpine meadows.—Caucasus: Cisc., Dag., E. Transc., S. Transc. (Zangezur); W. Siberia: Alt.; E. Siberia: Ang.-Say., Dau.; Far East: Kamch., Soviet Central Asia: T. Sh., Pam.-Al. **Gen. distr.:** Centr. Eur., Ind.-Him., Dzu.-Kash. Described from the Carpathians.

2. *L. rotatum* (L.) Fries ex Nym. Consp. Fl. Europ. (1881) 500; Kryl. Fl. Zap. Sib. IX, 2195.—*Swertia rotata* L. Sp. pl. (1753) 226.—*Pleurogyne rotata* Griseb. Gentian. (1839) 309; Ldb. Fl. Ross. III, 71; Kom. and Alis. Opred. rast. Dal'nevost. kr. II, 864; Kom. Fl. Kamch. III, 37.—*P. Stelleriana* G. Don, Gen. syst. IV (1830) 186.—*Lomatogonium Stellerianum* Kostel. in Allg. Med.-Pharm. Flora, III (1834) 1048.—*L. sulcatum* Rchb. ex Kostel. l.c.—*Pleurogyne sulcata* G. Don, l.c.—*Gentiana rotata* (L.) Froel. Gent. (1796) 105.—*G. Stelleriana* Scham. et Schl. in Linnaea, I (1826) 188, pro max. parte.—Ic.: GRF, No. 1119.

Annual, glabrous, green; root slender; stems simple, erect or more or less flexuous, 5-15 (30) cm long, with upright branches; basal rosette none; leaves small; basal leaves oblanceolate, strongly narrowed toward base, obtuse; cauline leaves narrowly linear, acute, 10-15 (25) mm long, 2-3 mm broad; pedicels long, slender; calyx 8-15 (20) mm long; calyx segments narrowly linear, acute, equaling, slightly longer, or rarely slightly shorter than corolla; corolla 8-15 (18) mm long, accrescent in fruit, azure or pale blue, darker-nerved; corolla lobes oblong-elliptic, acute; nectariferous pits pale, fringed; ovary orange, bluish at the top, obtuse; capsule ca. 12-15 mm long, oblong; seeds numerous, small, smooth. August-September (Plate XXXIII, Figure 3).

Wet meadows, swamps, river banks, and sometimes alkaline meadows in the forest zone and in the tundra of the European Arctic region.—Arctic: Eur. Arc. (Murman Coast, Kanin, Kolguev, Timan Tundra); W. Siberia: Alt.; E. Siberia: Ang.-Say., Dau., Lena-Kol.; Far East: Ze.-Bu., Okh.,

Kamch.; Soviet Central Asia: Dzu.-Tarb. **Gen. distr.:** Arc. Eur. (Lapland), Iceland, Mong., Jap., N. Am. (Alaska, Canada, Greenland). Described from E. Siberia. Type in London.

622

Genus 1156. **ANAGALLIDIUM** * GRISEB.

Griseb. Gentian. (1839) 311.

Flowers 4-merous; calyx and corolla persistent, parted nearly to base; corolla rotate; nectariferous pits above the base of each corolla lobe, with a small lateral scale not covering the whole pit; stamens with pendent dorsifixed anthers, the filaments adnate to corolla base, with tufts of hairs at the point of insertion; ovary unilocular, subsessile; stigma subsessile, biparted, with linear-oblong lobes; capsule unilocular, 2-lobed; seeds 10-15, ovaloid, light gray, smooth, ca. 1 mm long.

A monotypic genus, distributed through Siberia and Mongolia.

1. **A. dichotomum** (L.) Griseb. Gentian. (1839) 312; Ldb. Fl. Ross. III, 72; Kryl. Fl. Zap. Sib. IX, 2196.—*Swertia dichotoma* L. Sp. pl. (1753) 227; Ldb. Fl. alt. I, 291.—Ic.: Pall. Fl. Ross. II, tab. 91, f. 3.—Exs.: GRF, No. 1379.

Annual; roots slender; plants glabrous; stems 5-22 cm long, strongly branched from base, the weak and sometimes sprawling branches secondarily forked; basal leaves obovate, obtuse, narrowed at base into petiole, this as long as the blade; cauline leaves numerous, very thin and delicate, opposite, elliptic or oblong-ovate, acute, (5) 10-15 (25) mm long, (3) 5-10 (15) mm broad, narrowed at base into a short petiole; pedicels slender, many times the length of flower, 1-3 in the leaf axils, arched-recurved after flowering; calyx segments ovate, 2-4 mm long, acuminate, narrowed toward base; corolla rotate, whitish to pale green, $1\frac{1}{2}$ to 2 times as long as the calyx, 9-11 mm in diameter, elongating in fruit to 15 mm; corolla lobes ovate, obtusish; capsule broadly ovaloid, equaling the corolla lobes; seeds ovaloid, light gray, smooth, ca. 1 mm long. June-July.

Meadows, rarely gravelly places.—W. Siberia: Ob.(SE), Irt. (E.), Alt.; E. Siberia: Yen. (S.), Ang.-Say., Dau.; Soviet Central Asia: Balkh. (E.), Dzu.-Tarb. **Gen. distr.:** Dzu.-Kash., Mong. Described from Siberia. Type in London.

625

Genus 1157. **OPHELIA** ** D. DON.

D. Don ex G. Don, Gen. Syst. IV (1830) 178.—*Sczukinia* Turcz. in Bull. Soc. Nat. Mosc. XIII (1840) 165.—*Stellera* Turcz. l.c. 167, non L.

Flowers 4- or 5-merous; calyx and corolla parted nearly to base; corolla rotate; corolla lobes with two nectaries at base, the nectaries fringed, furnished with scales, or bare; stamens with pendent anthers, the filaments slender, distinct or rarely enlarged and connate at base; ovary sessile; stigma subsessile, 2-lobed; capsule unilocular, 2-valved. Annual plants.

* Named on account of superficial resemblance to the genus *Anagallis* of the family Primulaceae.

** Name possibly derived, according to Wirtstein, from Greek *ofelos*, meaning benefit.

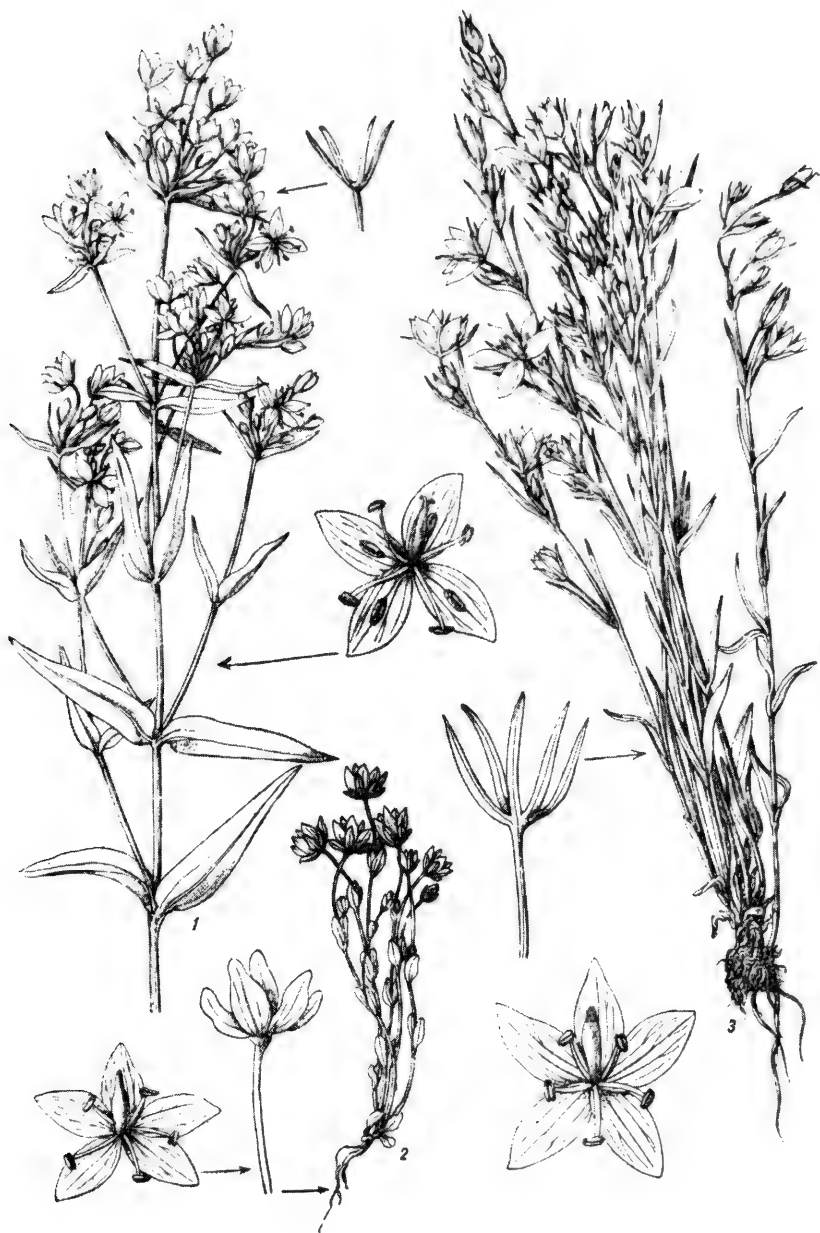


Plate XXXIII

1. *Ophelia tetrapetala* (Pall.) Grossh.— 2. *Lomatogonium carinthiacum* (Wulfen.) A.Br.—
3. *L. rotatum* (L.) Fries.

Species of the genus *Ophelia*, about ten in number, are distributed in Siberia, in the Far East, and in the mountains of Central and SE Asia; a few species in N. America (?).

1. Flowers as a rule 5-merous. 2.
- + Flowers as a rule 4-merous. 4.
2. Corolla golden-yellow; plants small, with flowers 4-5 mm long. 3. *O. Tscherskyi* (Kom.) Grossh.
- + Corolla dingy violet or pinkish-violet; flowers larger. 3.
3. Calyx and corolla (9) 12-15 (17) mm long; corolla lobes elliptic. 1. *O. chinensis* Bge.
- + Calyx and corolla 5-9 (10) mm long, the lobes oblong-oval. 2. *O. diluta* (Turcz.) Ldb.
4. Leaves linear or oblong, (2) 3-5 (10) mm broad; corolla 4-6 mm long, the lobes obtusish to acutish. 4. *O. tetrapetala* (Pall.) Grossh.
- + Leaves ovate-triangular, (12) 15-20 (23) mm broad; corolla 5-7 mm long, the lobes elongate-acute or acuminate. 5. *O. Wilfordii* Kerner.

1. *O. chinensis* Bge. ex Griseb. in DC. Prodr. IX (1845) 126; Turcz. Fl. baic.-dah. II, 271.—*Swertia chinensis* (Bge.) Franch. in Bull. Soc. Bot. Fr. XXXII (1885) 26; Kom. and Alis. Opred. rast. Dal'nevost. kr. II, 864.—*l.c.*: Kom. and Alis. *l.c.* Plate 263, Figures 1, 2.

Annual, glabrous, green; stems erect, faintly 4-angled, (6) 10-25 (30) cm long, simple or mostly branched from the middle or rarely from base, the branches upright; basal rosette none; leaves opposite, lance-linear to lanceolate, acute or acuminate, single-nerved, (1.5) 2-3 (4) cm long, (2) 3-5 mm broad, narrowed toward base, the lower short-petioled, the upper sessile; flowers 5-merous, numerous, borne, on short branchlets arising from leaf axils and bearing reduced, narrowly linear leaves, solitary or several, the pedicels 15-20 (25) mm long; calyx (9) 12-17 mm long, somewhat shorter to longer than corolla, the lobes narrowly linear acute; corolla pale or dingy pinkish-violet; corolla lobes elliptic, attenuate upward, acute and mucronate, 13-15 mm long; nectariferous pits 2 at base of each corolla lobe, profusely fringed; ovary oblong; stigma subsessile with oval lobes; capsule ovaloid-oblong, shorter than corolla; seeds numerous, very small angular-globose, brown. August-September.

Steppe slopes, sandy places, meadows, and alkaline sites.—E. Siberia: Dau.; Far East: Ze.-Bu., Uss. **Gen. distr.:** N. China, whence described. Type in Leningrad.

2. *O. diluta* (Turcz.) Ldb. Fl. Ross. III (1847) 73; Kryl. Fl. Zap. Sib. IX, 2199.—*O. chinensis* β . *dahurica* Bge. ex Griseb. in DC. Prodr. IX (1845) 126; Turcz. Fl. baic.-dah. II, 271.—*Sczukinia diluta* Turcz. in Bull. Soc. Nat. Mosc. XIII (1840) 166.—*Gentiana diluta* Turcz. in Bull. Soc. Nat. Mosc. XXII (1849) 338.

Annual, glabrous; stem erect, 4-angled, 15-45 cm long, simple or more often branched from base or higher up, the branches upright; basal rosette none; leaves opposite, lance-linear to lanceolate, acute or acuminate, single-nerved, (1) 2-3 (4) cm long, 2-6 mm broad, narrowed toward base, the lower short-petioled, the upper sessile; flowers numerous, on short branchlets bearing small leaves, solitary or several in leaf axils, the

slender erect pedicels 5-8 (10) mm long; calyx 5-7 mm long, slightly shorter than corolla, the lobes lance-linear acute; corolla lobes pale dingy-violet with dark nerves, oblong-oval, acute, 7-9 (10) mm long; nectaries yellow, enlarged at base, prolonged into a pit reaching to a quarter the length of petal, the margins long-fringed; ovary orange-yellow; stigma lobes nearly semicircular; placentas not protruding inward; seeds ovaloid, smooth, ca. 0.5 mm long. July-August.

Meadows and scrub along swampy banks. — W. Siberia: Alt. (E.); E. Siberia: Ang.-Say., Dau. **Gen. distr.:** Mong., Manch. Described from Nerchinsk. Type in Leningrad.

3. **O. Tscherskyi** (Kom.) Grossh. comb. n. — *Swertia Tscherskii* Kom. in Izv. Bot. Sada, XVI (1916) 177; Kom. and Alis. Opređ. rast. Dal'nevost. kr. II, 863.

627 Annual, glabrous, green; stem 4-angled, (5) 6-10 (16) cm long, simple or mostly more or less branched, the branches obliquely ascending; basal rosette indistinct, mostly wilting in flower; rosulate leaves small, oblanceolate-ovate; cauline leaves opposite, lanceolate to oval-lanceolate, subacute to acute, 13-15 (20) mm long, (3) 4-5 (6) mm broad, narrowed toward base, the lower short-petioled, the upper sessile; flowers numerous, borne on slender small-leaved lateral branchlets, the pedicels 4-7 mm long; calyx 5 (6) mm long, equaling to slightly exceeding the corolla, the segments narrowly linear-lanceolate, acute or subacute; corolla golden-yellow, the oblong-lanceolate acute lobes 4-5 mm long; nectaries in pairs at the base of each lobe, orange, the pits densely long-fringed; ovary oblong-ovate; stigma subsessile, with oval lobes; capsule oblong-ovoid, shorter than corolla lobes; seeds minute, irregularly globose, brown. September.

Dry meadows. — Far East: Uss. Endemic? Described from Pos'et area. Type in Leningrad.

4. **O. tetrapetala** (Pall.) Grossh. comb. n. — *Swertia tetrapetala* Pall. Fl. Ross. I, 2 (1788) 99; Kom. Fl. Kamch. III, 38; Kom. and Alis. Opređ. rast. Dal'nevost. kr. II, 864. — *S. Pallasii* D. Don, Gen. Syst. V (1837) 176. — *Stellera cyanea* Turcz. in Bull. Soc. Nat. Mosc. XV (1840) 167; Ldb. Fl. Ross. III, 73. — *Rellesta cyanea* Turcz. Fl. baic. dahur. II (1846) 270, obs. — *Anagallidium tetrapetalum* Griseb. Gentian. (1839) 312. — Ic.: Pall. l.c. tab. 90, f. 2.

Annual, glabrous, green; stem 4-angled, 20-40 (50) cm long, rarely 6-12 cm (f. *alpina* B. Kolesn.), simple or more or less branched from the middle or higher up, the internodes (2) 4-6 cm long; basal rosette none; leaves opposite, fleshy, narrowly linear to linear-oblong, rarely somewhat enlarged toward base, 10-20 (30) mm long, (2) 3-5 (to 10) mm broad, single-nerved, rarely obscurely 3-nerved, commonly obtuse, rarely subacute, the lowermost subpetiolate; flowers 4-merous, 6-10 (f. *alpina* B. Kolesn.) or mostly (6) 10-30 (50), gathered on the upper part of stem, in clusters in the leaf axils on slender small-leaved branchlets; pedicels slender, unequal, 5-30 mm long, erect; calyx 4-5 mm long, somewhat shorter than or equaling the corolla, the narrowly linear-lanceolate segments often blackish; corolla 4-6 mm long, elongating in fruit to 10 mm; corolla lobes oblong-oval, acutish, rarely obtusish, mucronulate, the outside uniformly dark blue or green-backed, or pale-backed and broadly
628 dark blue-margined, the inside pale and rather profusely dark blue-spotted;

nectariferous pits in pairs at petal base, covered in upper part by a pectinate lateral appendage; ovary narrowly oblong; stigma capitate, obscurely 2-lobed; capsule oblong, 8-9 mm long, with a slender acute beak 1 mm long; seeds globose, 0.5-1 mm long, light brown. August-October (Plate XXXIII, Figure 1).

Woods, coppices, meadows, and grassy tundra (Kamchatka), on balds among cedar shale (*f. alpina*).— Far East: Uss. Sakh. (Kurile Is.), Kamch., Okh., Uda, Endemic. Described from Kamchatka. Type in London.

5. *O. Wilfordii* Kerner in Ber. Naturw. Ver. Inssbr. I (1870) 102.— *Swertia Wilfordii* Kerner, l.c.; Kom. Fl. Man'chzh. III, 274; Kitag. Lineam. fl. Mansh. 361.— *S. anomala* Nakai in Tokyo Bot. Mag. XXVIII (1914) 331.

Annual, glabrous, green; stem faintly 4-angled, 30-40 cm long, rarely 5-12 cm long and then leaves much smaller (*f. pusila* Grossh.), branched, with obliquely ascending branches; internodes well developed, 2.5-4 (5.5) cm long; basal rosette none; leaves opposite, triangular-ovate, broadly rounded or rarely subcordate at base, triangular attenuate upward, acute, distinctly 3-nerved, occasionally also with two marginal veins evanescent above base, 2-3.5 cm long, (12) 15-20 (23) mm broad, rarely of same shape but smaller, 10-15 mm long and 8-10 mm broad (*f. pumila* Grossh.); flowers 4-merous, mostly very numerous, in clusters in leaf axils, the slender erect pedicels 1.5-2.5 cm long; calyx 5-6 mm long, the narrowly linear segments slightly shorter than to equaling the corolla; corolla 5-7 mm long, elongating in fruit to 10-11 mm; corolla lobes oblong-oval, acute or acuminate, dark blue throughout or on the outside, greenish on the back and at base, inside lighter with dark dots; nectaries paired at petal base, covered with a pectinate lateral appendage; ovary narrowly oblong; stigma capitate, obscurely 2-lobed; capsule ovoid-oblong to subovoid, 12-13 mm long; seeds globose, ca. 1 mm in diameter, light brown. August-September.

Oak and pine woods, thin scrub, and seacoasts.— Far East: Uss.

Gen. distr.: Manchuria. Endemic. Type in London; isotype in Leningrad.

Note. The typical material and some other examples of this species are represented by deformed specimens. The description, as here presented, refers to normally developed plants.

Flowers 5-merous, rarely 4-merous; calyx and corolla parted nearly to base; nectariferous pits cup-shaped in pairs or rarely solitary on the lower part of each petal, scaleless, fringed; stamens 4 or 5, with pendent anthers; ovary sessile; stigma 2-lobed, with broad reniform lobes; capsule unilocular, 2-valved, with laminate placentas along the sutures. Perennial plants, often with a distinct basal leaf rosette.

The genus contains about 30 species, chiefly distributed through the mountainous areas of Eurasia.

* Named after the Dutch horticulturist Emanuel Swert, author and editor of plant illustrations (*Florilegium*, 1612).

1. Flowers 4-merous 2.
- + Flowers 5-merous 4.
2. Corolla lobes 10-13 mm long 8. *S. Aucheri* Boiss.
- + Corolla lobes 7-9 mm long 3.
3. The margin of calyx segments smooth; corolla lobes elliptic 9. *S. lactea* Bge.
- + The margin of calyx segments ciliate and erose-dentate; corolla lobes narrowly lanceolate 10. *S. erosula* Gontsch.
4. Basal leaves relatively narrow, commonly gradually narrowed into petiole; seeds wingless, angled-tuberculate 5.
- + Basal leaves relatively broad, rather abruptly passing into petiole; seeds annular-winged 6.
5. Leaves 15-20 mm broad; calyx segments broadly white-margined 6. *S. marginata* Schrenk.
- + Leaves 7-14 (17) mm broad; calyx segments narrowly white-margined. 7. *S. graciliflora* Gontsch.
6. Cauline leaves opposite, united into sheaths 1-3 cm long. 7.
- + Cauline leaves opposite or alternate, distinct 8.
7. Plants 50-90 cm tall; calyx segments 4-5 mm long; corolla 7-8 mm long. 4. *S. connata* Schrenk.
- + Plants 60-120 cm tall; calyx segments 9-11 mm long. 5. *S. veratroides* Maxim.
8. Corolla lobes obtuse; cauline leaves alternate. 3. *S. obtusa* Ldb.
- + Corolla lobes strongly narrowed upward, acute or subacute. 9.
- 30 9. Cauline leaves opposite; plants relatively small; calyx segments 5-6 mm long; corolla 6-8 mm long. 1. *S. perennis* L.
- + Cauline leaves alternate; plants relatively large; calyx segments 5-7 mm long; corolla 11-13 mm long 2. *S. iberica* Fisch. et Mey.

Section 1. **PENTAMERAE** Grossh.— Flowers 5-merous.

Subsection 1. **Alatae** Grossh.— Seeds ovaloid, surrounded by a rather broad annular wing.

Series 1. **Perennes** Grossh.— Cauline leaves not united, opposite or alternate.

1. *S. perennis* L. Sp. pl. (1753) 226; Ldb. Fl. Ross. III, 74; Shmal'g., Fl. II, 215; Maevsk. Fl. ed. VII, 549; Fedch. and Fler. Fl. Evrop. Rossii, 759.— Ic.: Hegi, Ill. Fl. V, 3, tab. 214, 4.— Exs.: GRF, No. 181.

Perennial; rootstock small, ascending, simple or slightly branched at the top, (8) 15-40 (60) cm long; basal leaves long-petioled, the slender petioles as long as to slightly longer than blade; leaf blade ovate or elliptic, 5-nerved, 3-7 cm long, (1) 2-3 (4) cm broad, attenuate upward, obtuse; cauline leaves 1 or 2 pairs, commonly opposite, rarely alternate, strongly reduced, lanceolate to oblong-lanceolate, 1.5-2.5 cm long, amplexicaul but not united; inflorescence 7-10 (12) cm long, narrowly lanceolate, rather few-flowered; flowers 5-merous; calyx 5-6 mm long, the narrowly linear acuminate segments shorter than corolla; corolla grayish-blue or bluish-violet, very rarely yellowish-greenish, with darker dots and stripes; corolla lobes 6-8 mm long, oblong-lanceolate, narrowed upward, acutish to obtusish; nectariferous pits in pairs at base of corolla lobes, round,

dark violet, fringed; capsule ovoid, 10-12 mm long; seeds numerous, flat, annular-winged, ca. 2 mm broad. July-September (Plate XXXIV, Figure 3).

Wet meadows and swamps.—European part: Balt., U. Dnp., Lad.-Ilm.

Gen. distr.: Centr. and Atl. Eur., Bal.-As. Min. (Balkans). Described from Centr. Europe. Type in London.

2. *S. iberica* Fisch. et Mey. in Beitr. z. Pflanzenk. d. Russ. Reiches, VI (1849) 61; Kuzn. in Mat. Fl. IV, 3, 400; Grossg. Fl. Kavk. III, 232.—*S. iberica* var. *albida* Fisch. et Mey. l.c.; Kuzn. l.c.—*S. perennis* M.B. Fl. taur.-cauc. I (1809) 195, non L.—*S. stigmantha* C. Koch. in Linnaea, XXIII (1850) 586.—*S. punctata* Boiss. Fl. or. IV (1879) 78, 631 non Baumg.—*S. punctata* var. *concolor* Alb. Pr. fl. Colch. (1895) 177, p.p.—*S. iberica* var. *coerulea* Fisch. et Mey. l.c.; Kusn. l.c. 402.—*S. obtusa* β . *albiflora* Ldb. Fl. Ross. III (1846) 75.

Perennial; rootstock ascending, fairly stout, densely covered with fibrous roots; stem erect, simple or rarely slightly branched in upper part 20-40 (60) cm long; leaves alternate, except the sometimes opposite uppermost leaves; basal and lower leaves flat, the very broad petiole shorter than to as long as the blade; leaf blade 5-nerved, ovate to ovate-oblong, 7-10 (14) cm long, (3) 4-8 mm broad, obtuse, sometimes mucronate; cauline leaves 3-4 (5), alternate, gradually diminishing in size, oblong-ovate to lanceolate, short-petioled or sessile, acute, the uppermost 2-4 cm long; inflorescence 10-30 cm long, loosely long-paniculate; lower pedicels long, the others about as long as the flowers; flowers 5-merous; calyx 5-7 mm long; calyx segments narrowly linear-subulate, about half the length of corolla; corolla 11-13 mm long; corolla lobes oblong-lanceolate, acutish, whitish-yellow, commonly dark blue-dotted (var. *albida*) or rarely dingy blue (var. *coerulea*); nectariferous pits in pairs at lobe base, round, long-fringed; capsule oblong-ovoid, ca. 10 mm long; seeds flat, brown, ovaloid, annular-winged. July-September.

Wet meadows and banks in the high mountain zone.—Caucasus: Cisc., Dag., W., E., and S. Transc. Endemic. Described from the high-mountain zone of the Caucasus. Type in Leningrad.

3. *S. obtusa* Ldb. in Mem. Acad. Sc. Petersb. V (1812) 526; Fl. Ross. III, 75; Kryl. Fl. Zap. IX, 2199.—*S. perennis* β . *alternifolia* Cham. et Schlecht. in Linnaea, I (1826) 189, quoad pl. Sib.—*S. perennis* β . *obtusa* Griseb. Gentian. (1839) 331; DC. Prodr. IX, 132.

Perennial; rootstock ascending, covered with fibrous roots; plants glabrous, green; stem erect, simple or rarely slightly branched in upper part, (15) 20-35 (45) cm long; leaves alternate except for the sometimes opposite uppermost leaves; basal and lower cauline leaves long-petioled, the petiole slightly shorter than to as long as blade, the blade elliptic to oblong-elliptic, obtuse or short-acuminate, 5-nerved, 4-10 cm long, 1.5-3.5 (5) cm broad, the uppermost small, sessile, ovate-lanceolate, acute; flowers in a terminal racemose inflorescence, the slender pedicels as long as to slightly longer than the flower; calyx 5-parted; calyx segments lanceolate to linear-subulate, acuminate, 5-7 mm long, shorter than corolla; corolla dingy violet, very rarely white (f. *albiflora* Kar. et Kir.—Dzu.-Tarb.); corolla lobes 12-15 mm long, oblong-elliptic, obtuse, 632 strongly attenuate upward, subacute; nectariferous pits in pairs at petal base, round, fringed or with long threads 3-4 times the height of nectary;

capsule oblong-ovoid, narrowed toward top, slightly shorter than to equaling the corolla; seeds reniform, flattened, large, 2-2.5 mm in diameter. June-September (Plate XXXIV, Figure 1).

Meadows, banks of rivers and streams, and swampy meadows in the alpine tundra.—European part: V.-Ka. (Urals), Transv.; W. Siberia: Alt.; E. Siberia: Alt.; E. Siberia: Yen. (to 70°N), Ang.-Say., Dau., Lena-Kol; Far East: Ze.-Bu. (N.), Okh., Uda, Sakh. (N.); Soviet Central Asia: Dzu.-Tarb. **Gen. distr.:** Dzu.-Kash., Mong. Described from Transbaikalia. Type in Leningrad.

Series 2. **Connatae** Grossh.—Cauline leaves commonly opposite, united into long sheaths.

4. **S. connata** Schrenk, Enum. pl. nov. I (1841) 37; II, 31.—*S. connata* α . et β . Ldb. Fl. Ross. III (1847-1851) 75; Fedch. Rast. Turk. 649.

Perennial; rootstock stout, ascending, covered with coarse fibrous roots; plant glabrous, pale green; stem erect, stout and coarse, in lower part 5-8 (10) mm in diameter, simple or rarely in upper part slightly branched, 50-90 (100) cm long; basal leaves oblong to elliptic-oblong, 5-7-nerved, 18-35 cm long, the broad petiole commonly longer than blade, the blade triangular obtuse; cauline leaves strongly reduced, oblong-ovate to oblong, 5-10 cm long, opposite, united into broad sheaths to 20 cm long (f. *genuina* Grossh.) or rarely alternate with similar sheaths (f. *alternans* Schrenk.); flowers 5-merous, numerous, forming a dense compact panicle; calyx 4-5 mm long; calyx segments narrowly linear-lanceolate, acute, narrowly white-margined, half the length of corolla; corolla pale yellowish-white, with dark violet dots and lines inside, 7-8 mm long, elongating in fruit to 10 mm; corolla lobes oblong, obtuse or subobtuse; nectariferous pits in pairs at petal base, round, short-fringed; capsule ovoid-ovaloid, 11-13 mm long, beaked; seeds ovaloid, compressed, broadly winged, brown, ca. 2 mm long. July-August.

Glades, osier thickets, wet meadows, and banks in the upper mountain zone.—Soviet Central Asia: Dzu.-Tarb., T. Sh. (Centr. Tien Shan).

Gen. distr.: Dzu.-Kash. (Kuldja). Described from the foothills of the Dzungarian Ala Tau. Type in Leningrad.

635 5. **S. veratroides** Maxim. ex Kom. in Tr. Bot. Sada, XXV (1905) 276; Kom. and Alis Opred. rast. Dal'nevost.. kr. II, 863.—Ic.: Kom., l.c., (1905), Plate III.

Perennial; rootstock stout, ascending, covered with coarse fibrous roots; plant glabrous, green; stem erect, stout and coarse, 5-6 (to 10) mm in diameter in lower part, simple or rarely slightly branched in upper part, (30, rarely) 60-120 (150) cm long; lower leaves with flat pedicels (7) 10-20 cm long, the blade broadly elliptic, 5-7-nerved, commonly rounded-obtuse, (7) 10-17 cm long, (4) 7-10 cm broad; cauline leaves opposite, 3-5 pairs, the lower large, long-petioled, the others reduced, sessile, united into sheaths 2-4 cm long, oblong-ovate to oblong, obtuse; flowers 5-merous, numerous, forming a dense compact panicle (6) 10-30 cm long; pedicels of lower flowers long, the other shorter, slightly longer than flower; calyx 9-11 mm long; calyx teeth narrowly linear-lanceolate, acute, narrowly white-margined, half to two-thirds the length of corolla; corolla



Plate XXXIV

1. *Swertia obtusa* Ldb.—2a, 2b, 2c. *Halenia elliptica* D. Don.—2. *Swertia perennis* L.

light-colored, yellowish-white or yellowish-greenish, with blackish-violet dots and stripes inside; corolla lobes 13-20 mm long, narrowly oblong-lanceolate, obtuse, rarely slightly acutish, elongating in fruit to 20 mm; nectariferous pits in pairs at lobe base, round, fringed, the fringe exceeding pit diameter; capsule ovaloid-oblong, slightly narrowed at both ends, 11-13 mm long; seeds ovaloid, brown, ca. 2-3 mm long, broadly annular-winged. July-September.

Grassy slopes, wood margins, and river floodplains. — Far East: Ze.-Bu., Uda. **Gen. distr.:** Manchuria. Described from Amur River. Type in Leningrad.

Subsection 2. **RUGOSAE** Grossgh. — Seeds angular-globose to ovaloid, rugose-tuberculate, wingless.

Beside the species occurring in the USSR, this subsection includes the species *S. petiolata* Don (Himalayas, Kuldja).

6. ***S. marginata*** Schrenk in Bull. Acad. Sc. Petersb. X (1842) 353; Ldb. Fl. Ross. III (1847-1851) 75; Fedch. Rast. Turk. 649.

Perennial; rootstock vertical or ascending, with slender fibrous roots; plant glabrous, green; stem ascending, commonly simple, straight, 10-25 cm long, (2) 3 mm in diameter in lower part; basal leaves 4-10, narrowly oblong, 5-8 (12) cm long, (10) 15-20 mm broad, 3 or rarely 5-nerved, the broad petiole shorter than blade; cauline leaves mostly none or sometimes one pair and then strongly reduced, united into a terminal sheath; leaves subtending inflorescence still more reduced, opposite; 36 inflorescence an interrupted dense few-flowered panicle or subcapitate, terminal; calyx 5-6 mm long; calyx teeth oblong-lanceolate, short-acuminate, broadly white-margined, two-thirds the length of corolla; corolla 12-13 mm long; corolla lobes pale greenish-azure, darker on the back, obtuse; nectaries in pairs at lobe base, oval or round, fringed; capsule oblong-ovoid, truncate, 9-10 mm long, shorter than corolla; seeds angular-globose, tuberculate, dark brown, 0.3-0.5 mm long. July.

Alpine meadows, pebbles, and stony meadows in the high-mountain zone. — E. Siberia: Ang.-Say. (E.); Soviet Central Asia: Dzu.-Tarb., Syr D., T. Sh., Pam.-Al. **Gen. distr.:** Dzu.-Kash., Mong. (N.W.). Described from the Dzungarian Ala Tau. Type in Leningrad.

7. ***S. graciliflora*** Gontsch. in Tr. Bot. inst. AN SSSR, I, 1 (1933) 161.

Perennial; rootstock ascending stout; stem simple, erect, (5) 13-25 cm long, 2-3 mm in diameter at base; basal leaves 4-10, oblong to oblanceolate, 5-10 cm long, 7-14 (17) mm broad, obtuse, the short broad petiole 2-3 mm broad; cauline leaves none or one pair and then opposite, strongly reduced, distant or united into a very short sheath; inflorescence an interrupted few-flowered rather loose panicle of (3) 5-7 (18) flowers; pedicels slender, the length of flower, the flower ones longer; calyx 4-6 mm long; calyx teeth lanceolate, acute, narrowly white-margined, half the length of corolla; corolla 9-11 (12.5) mm long; corolla lobes oblong-ovate, obtuse, azure about the middle on the back, whitish-margined; nectaries in pairs at lobe base, round, sparsely and irregularly fringed; capsule ovoid-oblong, narrowed toward the top, 11-13 mm long; seeds angular-globose, tuberculate, ca. 1 mm long. June-August.

Alpine meadows. — Soviet Central Asia: Pam.-Al. Endemic. Described from the Gissar Range. Type in Leningrad.

8. *S. Aucheri* Boiss. Diagn. ser. I, 1 (1844) 90; Boiss. Fl. or. IV (1879) 78; Kuzn. in Mat. Fl. Kavk. III, 232.—*S. persica* Griseb. in DC. Prodr. IX (1845) 132.—*Ik.*: Jaub. et Sp. Illustr. Plate 235.—*Exs.*: Kotschy, *exs.* No. 665.

637 Perennial; rootstock ascending, stout; plant glabrous, pale green; stem erect, stout, coarse, 5-8 (10) mm in diameter in lower part, simple or rarely somewhat branched at the end, 40-75 cm long; basal leaves oblong to elongate-oblong, rarely oblanceolate-ovate, 14-23 cm long, indistinctly broad-petioled, subobtuse to subacute, 5-7-nerved; cauline leaves opposite, strongly reduced, oblong-lanceolate to linear-lanceolate, sessile, the uppermost commonly connate at base; flowers 4-merous, numerous, in a dense narrowly paniculate inflorescence; calyx 5-6 mm long; calyx segments narrowly lanceolate, acute, half the length of corolla; corolla pale yellow, unicolor; corolla lobes elliptic-oblong, acute or acuminate, 10-13 mm long; nectaries single on the lower third of each corolla lobe, profusely fringed; capsule ovoid-oblong, narrowed at both ends, 13-14 mm long; seeds brown, triangular, tuberculate, 1-1.5 mm long. July-August.

Wet places in high mountains.—Caucasus: S. Transc. (Zangezur, Kazikoporan). *Gen. distr.*: Arm.-Kurd., Iran. Described from Armenia. Type in Geneva.

9. *S. lactea* Bge. in Mem. sav. étrang. Acad. Sc. Petersb. VII (1854) 393; Boiss. Fl. or. IV, 79; Fedch. Rast. Turk. 649.

Perennial; rootstock stout, ascending, densely covered with fibrous roots; plant glabrous, green; stem erect, rather coarse, 4-7 mm thick at base, simple, rarely somewhat branched at the end, 30-70 cm long; leaves all opposite; basal and lower leaves oblong-oblanceolate to oblong-obovate, 3-5-nerved, 10-20 (35) cm long, 2-4 cm broad, obtuse to sometimes round-tipped, gradually tapering into petiole; petiole longer than blade, broad, enlarged at base, amplexicual; cauline leaves 2 or 3 pairs, sometimes 2 or 3 alternate, gradually decreasing in size up to stem, oblong to oblong-oblanceolate, amplexicaul at base but not connate, the uppermost 2-4 cm long; paired flower clusters forming a loose oblong paniculate inflorescence; pedicels as long as or longer than flowers; flowers 4-merous; calyx 4-6 mm long, half the length of corolla; calyx segments lance-linear, narrow, acute, smooth; corolla 7-9 mm long; corolla lobes pale blue to nearly white, elliptic, obtuse; nectariferous pit single, large, round to subreniform, sparsely fringed; capsule oblong-ovoid, narrowed at both ends, beakless, 9 mm long; seeds dark brown, angular-globose, tuberculate, ca. 1 mm long. July-September.

Dry meadows and banks in the upper mountain zone.—Soviet Central Asia: T. Sh., Syr D., Pam.-Al. Endemic. Described from Karatau Range. Type in Leningrad.

638 10. *S. erosula* Gontsch. in Tr. Bot. inst. AN SSSR, I, 1 (1933) 162.

Perennial; rootstock stout, ascending, densely covered with fibrous roots; stem erect, rather coarse, ca. 5 mm thick at base, 50-90 cm long; basal leaves oblong or oblanceolate, obtuse or round-tipped, 10-27 cm long, 2-5 cm broad, the petiole as long as or slightly longer than blade; cauline leaves opposite, distinct, 1 or 2 pairs, much reduced, oblong-lanceolate, the uppermost 5-6 cm long; inflorescence 20-70 cm long, interrupted,

consisting of dense many-flowered paired pedunculate clusters; flowers 4-merous; calyx ca. 7 mm long, about equaling the corolla; calyx teeth lanceolate to ovate-lanceolate, acute, the margin ciliate or more rarely dentate-erose; corolla ca. 8-9 mm long, 2.5-3 mm broad; corolla lobes yellowish, violet-tipped, narrowly linear-oblong; nectariferous pit single, rounded-reniform, ca. 3 mm broad and 2 mm long, ciliate-pectinate. July.

Wet meadows in the high-mountain zone. — Soviet Central Asia: T. Sh. (W.). Endemic. Described from Angren River valley. Type in Leningrad.

Genus 1159. **HALENIA** * BORKH.

Borkh. in Roem. Arch, I, 1 (1796) 25.

Flowers 4-merous; calyx 4-parted nearly to base; corolla broadly campanulate, parted to the middle into straight lobes, these prolonged at base into slender hollow spurlike nectaries; stamens inserted in corolla throat, with pendent anthers; ovary sessile; stigma sessile, 2-lobed, the lobes oblong; capsule unicellular; 2-valved; placentas on the sutures, deeply intruding into the ovary; seeds numerous, large.

The genus contains about 15 species; of these two or three occurring in Mexico and in the mountains of E. Asia, the others in North and South America (Andies).

1. Plants 15-40 cm tall; flowers 8-11 mm long, pale greenish-yellow; calyx segments linear 1. **H. corniculata** (L.) Cornaz.
- + Plants 40-60 cm tall; flowers 4-5 mm long, azure; calyx segments ovate 2. **H. elliptica** D. Don.

1. **H. corniculata** (L.) Cornaz in Bull. Soc^o Sc. Nat. Neuch. XXV (1897) 171; Druce in Rep. Bot. Exch. Club Brit. Isl. 1913, III, 5 (1914) 419; Fedch. and Fler. Fl. Evrop. Rossii, 760; Kryl. Fl. Zap. Sib. IX, 2198. — **H. sibirica** Borkh. in Römer. Arch. I (1796) 25; Griseb. Gentian., 323; Ldb. Fl. Ross. III, 74; Kom. Fl. Kamch. III, 39; Kom. and Alis. Opred. rast. Dal'nevost. kr. II, 864. — **H. Fischeri** Graham in Edinb. New phil. Journ. (1830) 174; Ldb. Fl. Ross. III, 74, in nota; DC. Prodr. IX, 128. — **Swertia corniculata** L. Sp. pl. (1753) 227. — Ic.: Pall. Fl. Ross. II, tab. 90, f. 1; Kom. and Alis. l.c. Plate 264, 5-7. — Exs.: GRF, No. 428, 1233; P. Smirn. Pl. alt. No. 68.

Annual; root slender; plant glabrous, green; stem erect, 4-angled, commonly branched, sometimes from base, (12) 15-40 (50) cm long, the branches obliquely ascending; leaves opposite; basal rosette rather indistinct, the leaves obovate-lanceolate, petiolate; cauline leaves oblong-elliptic, narrowed toward base, acute, 3-nerved, 1-2 (4) cm long, 5-10 (12) mm broad; flowers 4-merous, borne at the ends of stems and branches in umbelliform clusters; pedicels very unequal, the lowest much longer than flower; calyx 6-8 mm long; calyx teeth linear-subulate, half to two-thirds the length of corolla; corolla 8-11 mm long, elongating in fruit to 15 mm, pale greenish-yellow; corolla lobes the length of tube, ovate to oblong-ovate, short-acuminate; spurs horizontal or ascending, slender, slightly shorter than to as long as corolla lobes; capsule oblong, 13-15 mm long; seeds few, ovaloid, smooth, brown, 1-1.5 mm long. July-September.

* Named after Jonas P. Halenius, collaborator of Linnaeus and author of one of the early studies (1750) on the plants of Kamchatka.

Meadows, woods, wood margins, and thin forests. — European part: V.-Ka. (NE Urals); W. Siberia: Ob (SE), Alt.; E. Siberia: Ang.-Say., Dau., Lena Kol. (S.); Far East: Ze.-Bu., Okh., Uda, Kamch., Sakh. (and Kurile Is.), Uss. **Gen. distr.:** Mong., Manchuria. Described from Siberia, from Gmelin's collections. Type in London.

2. **H. elliptica** D. Don in Trans. Linn. Soc. XVII (1837) 529; Hook. Fl. Brit. Ind. IV, 130; Fedch. Rast. Turk. 650.

Annual; roots slender; plant glabrous, green; stem erect, 4-angled, branched from the middle or rarely from base, 40-60 cm long, the branches obliquely ascending; leaves opposite; basal leaves obovate to obovate-elliptic, obtuse, ca. 3 cm long, ca. 10-12 mm broad, marcescent; cauline leaves elliptic to oblong-elliptic, little narrowed toward base, subamplexicaul, subacute, 5-nerved, 18-25 mm long, 5-10 mm broad; flowers 4-merous, borne at the ends of stems and branches in umbelliform clusters; pedicels very unequal, the lowest much longer than flowers; calyx 3-4 mm long; calyx segments oblong-ovate to ovate-lanceolate; corolla 640 4-5 mm long, elongating in fruit to 6 mm, azure or pale azure; corolla lobes the length of tube, oblong-ovate, acute; spurs horizontal or ascending, slender, longer than calyx and nearly equaling the corolla; capsule ovoid, ca. 7 mm long; seeds numerous, pale brown, 1-1.5 mm long, smooth. July (Plate XXXIV, Figure 2).

Meadows. — Soviet Central Asia: T. Sh. (floodplains of Bayan-Kol). **Gen. distr.:** Dzu.-Kash., Ind.-Him., Centr. China? Described from the Himalayas. Type in London.

Family CXXXI. **MENYANTHACEAE** G. DON.*

Calyx 5-parted; corolla infundibular or infundibular-rotate with a broad 5-parted limb; corolla lobes fringed or bearded on upper surface; aestivation of corolla induplicate-valvate; stamens 5, alternate with corolla lobes; style 1, with 2-lobed stigma; hypogynous glands 5, alternate with stamens; ovary borne on a fleshy serrate dish or somewhat emerged in receptacle and thus appearing half-superior; capsule unilocular, many-seeded, 2-valved, with 2 parietal placentas; seed coat crustaceous. Paludal or aquatic perennials; leaves alternate, arising from rootstock, sometimes compound or crenate-dentate; flowers at the end of a leafless scape, rarely on long peduncles in leaf axils.

The family contains 5 or 6 genera of paludal and aquatic plants. Most species distributed through the tropics and in the southern hemisphere.

Key to Genera

1. Leaves floating, simple, rounded-elliptic. 1162. **Nymphoides** Hill.
- + Leaves aerial 2.
2. Leaves trifoliate; flowers in a raceme; corolla lobes densely long-bearded on the inner surface ecarinate. 1161. **Menyanthes** L.

* Arranged by E. G. Bobrov.

- + Leaves simple, reniform, crenate-margined; flowers in a cymose-corymbose inflorescence; corolla lobes lacerate-dentate, carinate.
 1160. **Fauria** Franch.

641

Genus 1160. **FAURIA*** FRANCH.

Franch. In Bull. Soc. Philom. de Paris, VII sér. X (1886) 140. — *Nephrophyllidium* Gilg in Engl. — Pr. Pflanzenf. IV, 2 (1895) 105, f. 47.

Flowers bisexual; receptacle concave, conical at the top; calyx deeply 5-parted; calyx segments distinct, inserted at the top of receptacle, oblong-lanceolate; petals 5, thick, simple, carinate; stamens 5, opposite petals, the filaments subulate from an enlarged base; anthers deeply sagittate, opening lengthwise on the sides; ovary half-superior, ovoid-conical, fully unilocular, the styles fused all the way up; stigma 2-lobed; placentas 2, parietal, with numerous ovules. Perennial herbs with a stout horizontal rootstock and numerous radical leaves, these chartaceous, palmately nerved, crenate.

A monotypic genus, the single species occurring in the mountain bogs of the North Pacific area. About ten closely related species are distributed in Australia, Tasmania, and neighboring countries, and are usually placed in the genus *Villarsia* Vent.

1. **F. crista galli** (Menz.) Makino in Tokyo Bot. Mag. XVIII (1904) 15. — *F. japonica* Franch. in Bull. Soc. Philom. de Paris, VII ser. X (1886) 141. — *Menyanthes crista galli* Menz. in Hook. Bot. Misc. I (1830) 45, tab. 34. — *Villarsia crista galli* Griseb. Gentian. (1839) 338; Ldb. Fl. Ross. III, 76; Hook. Fl. bor.-am. II, 70. — *Nephrophyllidium crista galli* (Menz.) Gilg. in Engl. — Pr. Pflanzenf. IV, 2 (1895) 105. — Ic.: Gilg. l.c. f. 47.

Perennial, glabrous, green; rootstock long, stout, creeping, ascending at the top and bearing a tuft of leaves and a leafless scape (20) 40-50 (70) cm long; leaves with petioles (3) 5-10 (27) cm long, enlarged at base into short sheaths; leaf blade reniform, crenate, 2-3 (5) cm long and 5-6 (10) cm broad, palmately nerved; inflorescence cymose-corymbose at the end of scape; calyx 3-4 mm long; calyx segments oblong-lanceolate, about half the length of corolla; corolla (6) 8-10 mm long, white, 5-parted to about the middle or lower down; lobes oblong-ovate, acutish, lacerate-dentate, revolute, carinate; stamens bare with bare filaments; style rather short; stigma 2-lobed; capsule oblong, 10-13 mm long, cuspidate; seeds numerous, slightly flattened, ovaloid, smooth, light brown, 1-1.5 mm long. July-August.

642 Mountain bogs. — Far East: Sakh. (Kurile Islands). **Gen. distr.:** Japan, North America. Type in London.

* Named after the missionary Faurie, who collected a large number of Japanese plants.

Flowers 5-merous; calyx deeply 5-parted; corolla deciduous, campanulate-infundibular; corolla lobes rather thick, densely white-bearded on the inner surface; stamens inserted at the base of corolla lobes; style long; stigma 2-lobed; hypogynous disk fleshy, obtusely crenate-margined; capsule unilocular, 2-lobed, dehiscing between the placentae, these located at the middle of valves; seeds large, ellipsoid, compressed, smooth.

The one species of this genus occurs throughout the forest zone of the northern hemisphere.

Menyanthes seeds have been reliably identified in the USSR in various geological layers from the Miocene to the Quaternary period.

Menyanthes parvula Nik. in the upper Miocene of the Ob region (Ekaterinoslavoe on the Irtysh R.)—*M. trifoliata* L. in the middle Pliocene of V.-Don (Krivobor'e); in lower Pliocene of Transv. (Yumaguzinskaya); in early Quaternary of L.V. (Raigorod), L. Don (Novokhopersk), V.-Don (Samarskaya Luka, Stavropol); in interglacial layers of U. Dnp. (Murava, Drozhzhino, Mikulino, Dubrova, Grodno, Samostrel'niki, Prechistaya); V.-Ka. (Galich); in Quaternary layers of Lad.-Ilm. (Borok and the settlement of Il'ya Prorok in the Kalinin Region); Dv.-Pech. (Sodimka R. near Vologda); Ob (Demyanskoe on the Irtysh R.).

1. **M. trifoliata** L. Sp. pl. (1753) 145, ed. 2 (1762) 208; M.B. Fl. taur.-cauc. I, 141; Ldb. Fl. Ross. III, 76; Turcz. Fl. baic.-dah. II, 275; Boiss. Fl. or. IV, 64; Shmal'g. Fl. II, 211; Kuzn. in Mat. Fl. Kavk. IV, 1, 408; Grossg. Fl. Kavk. III, 232; Kom. Fl. Kamch. III, 39; Kryl. Fl. Zap. Sib. IX, 2201.—Ic.: Fedch. and Fler. Fl. Evrop. Rossii, 760; Syreishch. Ill. Fl. Mosk. gub. III, 334; Kom. and Alis. Oprod. rast. Dal'nevost. kr. II, 263, 3-8; Kom. Sbor. sushka i razv. lek. rast., Plate 12.—Exs.: Fl. ital. exs. No. 1113; Fl. Stir. exs. No. 1225.

643 Perennial, glabrous, green; rootstock long, stout, creeping, articulate, ascending in upper part and bearing alternate leaves; scape leafless, 15-35 cm long; leaves with pedicels 17-30 cm long, enlarged at base into a long membranous sheath; leaflets 3, 3-10 (15) cm long, 1.5-3 (7) cm broad; elliptic or oblong-ovate, entire, rarely sparsely dentate; raceme terminal, dense, 3-7 cm long, becoming loose and elongated in fruit; pedicels shorter than flowers, the lower usually longer, subtended by 2 bracteoles; calyx 2-3 mm long; calyx segments ovate-lanceolate, obtusish; corolla white or pale rose, 10-14 mm long, parted to half or less, lanceolate, acute, densely long-bearded on inner surface; style long, slender; stigma 2-lobed; capsule subspherical-ovoid, pointed, 7-8 mm long; seeds numerous, slightly compressed ellipsoid, smooth, brownish. May-August.

Mossy bogs, backwaters, and standing water.—Arctic: Arc. Sib., An.; European part: all regions, except Crimea; Caucasus: rare in all regions, none in Tal.; W. Siberia: all regions; E. Siberia: all regions; Far East: all regions; Soviet Central Asia: Dzu.-Tarb. (Dzungarian Ala Tau).

Gen. distr.: Scand., Centr. and Atl. Eur., Med., Bal.-As. Min., Ind.-Him., Dzu.-Kash., Mong., N. Am. Described from W. Europe. Type in London.

* Named mentioned by Theophrastus, from Greek *menyein* = indicate, disclose, and *anthos* = flower, possibly alluding to the fact that the white flowers of this plant indicate boggy places. According to another version, from *men* = month, moon, and *anthos* = flower, on account of the flowers being open also at night.

Genus 1162. **NYMPHOIDES** * HILL.

Hill Brit. Herb. (1756) 77; Medik. Phil. Bot. I (1789) 25.—*Limnanthemum* S.G. Gmel. in Novi Comment. Acad. Sc. Petropol. XIV, 1, 1769 (1770) 527, tab. 17, f. 2; Griseb. Gentian., 341.—Schweykerta C.C. Gmel. Fl. Bad. I (1805) 447.—*Waldschmidtia* Bluff et Fing. Consp. Fl. Germ. I (1825) 265.

Flowers 5-merous; calyx 5-parted to base; corolla deciduous, short-tubed, wide open to subrotate, deeply lobed; corolla lobes fringed, the tube with fringed appendages; stamens inserted in corolla throat, the filaments short, the anthers erect; hypogynous disk fleshy, short-lobed, style long; stigma 2-lobed; capsule indehiscent, unilocular, with 2 parietal placentae; seeds ovaloid, flattened.

In addition to one circumpolar species, this genus contains about 20 species distributed through the tropics and subtropics of both hemispheres.

1. Corolla yellow, 15-22 mm long; capsule 18-25 mm long; seeds flat, broadly with a broad fringelike margin, ciliate 1. **N. peltatum** (S.G. Gmel.) O Ktze.
- + Corolla white, 4-5 mm long; capsule 4 mm long; seeds not flattened, smooth, lustrous 2. **N. koreanum** Lév.

1. **N. peltatum** (S.G. Gmel.) O. Ktze. Rev. Gen. (1891) 429; Grossg. Fl. Kavk. III, 232.—*Limnanthemum nymphoides* (L.) Link in Hoffmsg. et Link, Fl. Portug. I (1809) 344; Ldb. Fl. Ross. II, 77; Turcz. 644 Fl. baic.-dah. II, 227; Boiss. Fl. or. IV, 65; Shmal'g. Fl. II, 211; Kuzn. in Mat. Fl. Kavk. IV, 1, 410; Fl. Yugo-Vost, VI, 45; Maevskii, Fl. ed. 7, 580.—*Menyanthes nymphoides* L. Sp. pl. (1753) 145; Willd. Sp. pl. I, 810; M.B. Fl. taur.-cauc. I, 140.—*Limnanthemum peltatum* S.G. Gmel. in Novi Comment. Acad. Sc. Petropol. XIV, 1, 1769 (1770) 527.—Ic.: S.G. Gmel. l.c. tab. 17, f. 2; Fedch. and Fler. Fl. Evrop. Rossii, 761; Syreishch. Ill. Fl. Mosk. gub. III, 334; Fedch. Rast. Turk. 651; Kom. and Alis. Opred. rast. Dal'nevost. kr. II, Plate 264; 1-4.—Exs.: GRF, No. 1120, 2177; Fl. Ital. exs. No. 131.

Perennial; rootstock creeping, to 1.6 m long, articulate; stems long, rising to water surface; leaves floating, long-petioled; leaf blade rounded-elliptic or rarely orbicular, cordate at base, 3-5 (11) cm long, (2) 3-5 (10) cm broad, densely covered on the underside with darkish glandular spots, the margin entire or shallowly sinuate; flowers in axillary umbellate clusters, not exceeding the pedicels, 5-6 cm long; calyx 7-8 (9) cm [?] long, the segments lanceolate obtusish; corolla 15-22 mm long, bright yellow, parted to two-thirds; corolla lobes obovate, emarginate, the margin finely short-fringed; base of filaments furnished on both sides with a tuft of long hairs; appendages below filament base 5, oblong-oval, long ciliate at the top; anthers enlarged in lower part; style longer than ovary; stigma 2-lobed, the lobes ovate flat with crenate crisped margin; capsule ovoid, 18-20 (to 25) mm long, many-seeded; seeds flat, broadly ellipsoid, broadly ciliate-fringed, 6 mm long, 3 mm broad. July-September.

Standing or slow-moving water.—European part: Dv.-Pech., V.-Ka., Transv., Balt., U.V., U. Dnp., Bes., Bl., L. Don, L.V.; Caucasus: Cisc., W., and E. Transc., Dag.; W. Siberia: all regions; E. Siberia:

* Alluding to resemblance of leaves of this plant to those of *Nymphaea*.

Yen., Ang.-Say., Dau.; Far East: Ze.-Bu., Uda, Uss.; Soviet Central Asia: Ar.-Casp., Balkh., Dzu.-Tarb., Syr D., Amu D. **Gen. distr.:** Centr. and Atl. Eur., Med., Bal.-As. Min., Iran., Ind.-Him., Dzu.-Kash., Mong., China, Japan. Described from W. Europe. Type in London.

2. **N. koreanum** Lév. in Fedde, Repert. VIII (1910) 284; Kom. and Alis. Oprod. rast. Dal'nevost. kr. II, 869.

Perennial; rootstock rather slender, commonly somewhat creeping; style rising to water surface; leaves floating, numerous, rounded-elliptic to orbicular, cordately incised nearly to the middle, 3-4 cm long, 3-4 cm broad, densely covered on lower surface with small darkish glandular spots, the margin entire; petiole commonly adnate to stem, hence
645 inflorescence apparently arising from petiole; flowers in clusters of 3-7, with unequal pedicels; calyx 2-3 mm long, the segments lanceolate; corolla ca. 4-5 mm long, white, the lobes oblong; corolla 4-5 mm long; seeds not compressed, ovaloid, smooth, pale yellow, lustrous, 0.75-1 mm long. July-August.

At lakes.—Far East: Uss. (Pos'et area). **Gen. distr.:** Manch., Korea. Described from Korea. Type in Paris.

Family CXXXII **APOCYNACEAE** LINDL. *

Flowers actinomorphic, bisexual, 5-merous; calyx deeply parted, persistent in fruit; corolla gamopetalous, infundibular or campanulate, appendaged at base, the appendages alternate with stamens; stamens 5, included in corolla tube and alternate with the lobes, the distinct filaments inserted at base or middle of corolla tube; anthers straight or sagittate; nectaries fleshy, surrounding the base of ovary, consisting of five glands or two glands by reduction of the rest, alternate with calyx segments, or nectaries wanting; ovary superior or subinferior, 2-carpellate, the distinct carpels with styles united into one; fruit of two elongated follicles, dehiscent along the ventral suture. Perennials, subshrubs or shrubs, with opposite or alternate, elliptic, ovate, or linear, entire leaves.

The family contains 132 genera and about 1000 species, essentially confined to the tropics. Of the few genera occurring in the temperate region, four are represented in the USSR.

The following genera, not represented in contemporary flora, are known in fossilized condition.

Genus **APOCYNOPHYLLUM**

Apocynophyllum helveticum Heer in the Eocene Buchak layers of U. Dnp. (Kremyanka on the Uzh R.); in the Eocene of upper Tobol (Baki in the S. Urals).—*A. ibericum* Palib. in the Sarmatian layers of E. Transc. (Khviteba, E. Georgia).—*A. Lambertii* Wat. in the Eocene Buchak of U. Dnp. (Kremyanka on the Uzh R.).—*A. lanceolatum* Ung. in the Paleocene of L. V. (Mt. Ushi).—*A. cf. neriiifolium* Heer in the Eocene Buchak of U. Dnp. (Volyanshchina).—*Apocynophyllum* sp. n. Pimenova in the Eocene of U. Dnp. (Kremyanka, Karpikha, Kochetin).—*Apocynophyllum* sp. in the Sarmatian layers of Bl. (Ambrosievka).

* Arranged by E. G. Pobedimova.

Genus **ECHITONIUM**

Echitonium cuspidatum Heer in the Oligocene of V.-Don (Tim).—*E. Schischkinii* in the Oligocene of Transc. (Tori).—*Echitonium* sp. in the Eocene of U. Dnp. (Karpikha).

Genus **RAUWOLFIA**

Rauwolfia plumeriaefolia Ett. in the Miocene of Bl. (Ambrosievka).

Key to Genera

1. Shrubs; leaves 12-14 cm long, lanceolate, evergreen coriaceous; flowers rose, fragrant, without nectaries; throat of corolla with dissected ligulate appendages ***Nerium** L.
- + Perennial herbs or subshrubs; leaves elliptic, ovate or linear, 4-7 cm long, evergreen or deciduous; flowers odorless, with nectaries, without dissected appendages in corolla throat 2.
2. Flowers solitary in leaf axils, infundibular; stamens free or at most adjacent to the broad villous style, but the anthers not adherent; nectaries of two glands; seeds not comose 1163. **Vinca** L.
- + Flowers in cymes at the ends of stems and branches, campanulate or salverform; anthers adherent by ventral side to the middle part of style; seeds with a coma of long white hairs 3.
3. Leaves alternate; flowers 20-30 mm in diameter, nodding; corolla salverform; ovary superior 1165. **Poacynum** Baill.
- + Leaves opposite, sometimes the upper ones alternate; flowers 5-15 mm in diameter, strict; corolla campanulate; ovary subinferior 1164. **Trachomitum** Woodson.

Subfamily 1. **PLUMIEROIDEAE** Schum. in Engl.—Pr. Pflanzenf. IV, 2 (1895) 122.—Stamens free, adjacent but not adherent to stigma; anther cells not appendaged, filled with pollen down to base; seeds not comose.

Genus 1163. **VINCA*** L.

L. Sp. pl. (1753) 209.—*Pervinca* Adans. Fam. II (1793) 172.—*Lochnera* Rehb. Consp. (1828) 134.—*Catharanthus* G. Don, Gen. Syst. IV (1837) 95.

Calyx deeply 5-parted; calyx segments narrow, acute, with two minute teeth at or slightly above base; corolla infundibular, the long slender cylindrical tube somewhat enlarged about the middle; the throat bare or pubescent, the flat limb with 5 sinistrorsely twisted lobes; stamens 5, adnate to the middle of corolla tube, alternate with lobes; anthers short, dilated, with thickish apically enlarged connective, incumbent on the broad stigma; nectar glands two, adnate to ovary, round; pistil of two distinct

* From Latin *vincera* = to conquer, on account of the evergreen leaves of many species, or from Latin *vincire* = to wind, in allusion to the flexible twining stems.

carpels, with styles united into one simple apically enlarged style, a thick villous stigma, and a membranous ring below the stigma; carpels developing into distinct cylindric follicles dehiscent along the ventral suture; seeds not comose, albuminous, with a straight embryo. Perennials with opposite leaves and solitary axillary flowers.

The genus contains in all 7 species, mostly distributed in the Mediterranean region.

1. All stems erect, simple; leaves sessile (Soviet Central Asia) 5. *V. erecta* Rgl. et Schmalh.
- + All stems or merely the sterile trailing, branched; leaves petiolate. 2.
2. Leaves thin, deciduous, rough-margined; corolla tube 15 mm long, abruptly enlarged in upper part; corolla lobes 10 mm long, 3-5 mm broad; all stems trailing but not rooting 4. *V. herbacea* Waldst. et Kit.
- + Leaves coriaceous, evergreen; corolla tube 10-12 mm long, gradually enlarged upward 3.
3. Leaves glabrous, elliptic; calyx segments two-fifths the length of corolla tube, lanceolate, glabrous. 1. *V. minor* L.
- + Leaves pubescent, ovate; calyx segments more than half the length of to nearly equaling the corolla, linear, ciliate 4.
4. Leaves and calyx segments ciliate-margined; stems glabrous; flowers 30-50 mm in diameter. 3. *V. major* L.
- + Leaves pubescent on the margins and on the veins beneath; stems pubescent; flowers 20-30 mm in diameter 2. *V. pubescens* Urv.

Section 1. **PERVINCA** DC. Prodr. VIII (1844) 383.—Corolla blue or white, with bare throat; stamens adnate to middle of corolla tube; leaves petiolate; stems prostrate or ascending, firm, stringy, often rooting, branched.

1. *V. minor* L. Sp. pl. (1753) 209; DC. Prodr. VIII, 383; Ldb. Fl. Ross. III, 42; Shmal'g. Fl. II, 206; Grossg. Fl. Kavk. III, 233.—*V. humilis* Salisb. Prodr. (1796) 146.—*V. intermedia* Tausch in Flora, XIX (1836) 386.—*V. ellipticifolia* Stokes, Bot. Mat. Med. I (1842) 495.—*V. acutiflora* Bertol. ex Koch, Syn. Fl. Germ. ed. II (1844) 557.—Ic.: Rchb. Ic. Fl. Germ. XVII (1854) tab. 1062; Fedch. and Fler. Fl. Evrop. Rossii (1910) 762.—Exs.: Fl. exs. Reipubl. Bohem.-Sloven. exs. No. 255; Fl. Gal. et Germ. exs. No. 54.

648 Perennial; sterile stems prostrate, rooting, branched; flowering stems erect; leaves elliptic, 3-5 cm long, 1.5-2.5 cm broad, acute to subobtusely, coriaceous, evergreen, lustrous above, glabrous, short-petioled; pedicels equaling or exceeding the leaves; flowers blue, solitary, axillary; calyx segments 3-4 mm long, two-fifths the length of corolla tube, lance-triangular, acute, glabrous; corolla 2.5 cm in diameter, the tube 12 mm long, enlarged upward; corolla lobes 10-12 mm long, obtuse and truncate; pocketlike plaits in throat between the lobes obtriangular, the base of the triangle emarginate, with two very small teeth on the sides; anthers included in corolla tube, ovaloid, 4 mm long, twice as long as the enlarged part of the short filaments and adjacent to stigma; filaments broad,

subterete, inflexed, abruptly narrowed and geniculate at base; connectives apically dilated, connivent about the stigma, covered on the back in upper part with long stiff white hairs; follicles cylindric, acuminate, greenish; seeds brown, oblong, cylindric, tuberculate.

Sometimes naturalized in shady woods. — European part: Balt., M. Dnp., U. Dnp., Bl., Bes., U. Dns., Crim.; Caucasus: W. Transc. (only in N. part). **Gen. distr.:** Atl. Eur., W. Med., Bal.-As. Min. Described from W. Europe. Type in London.

Economic importance. A favorite ornamental plant of gardens, parks and cemeteries, where often naturalized; white- and double-flowered plants occur. Grown in areas around the Volga, in Soviet Central Asia (e.g., Lake Balkhash region), and in other regions.

2. **V. pubescens** Urv. in Mem. Soc. Linn. I (1822) 282; Urv. Enum. 26; Grossg. Fl. Kavk. III, 234. — **V. major** Ldb. Fl. Ross. III (1846-1851) 42 (pl. cauc.). — **V. major** var. **major** Pichon in Bull. Mus. Nat. Hist. Nat. ser. 2; XXIII, 4 (1951) 443, non L. p.p. — **V. major** L. **β. pubescens** Boiss. Fl. or. IV (1879) 45; Kuzn. in Mat. Fl. Kavk. IV, 2, 417. — Exs.: Pl. or. exs. No. 394.

Perennial; stem covered with stiff hairs; sterile stems trailing, not rooting; flowering branches shorter than the sterile and commonly erect; leaves ovate, 3-6 cm long, 2-3.5 cm broad, acute, rounded to subcordate at base, thinner than in the preceding species, with stiff hairs on the margin and on veins on both sides, short-petioled, wintering; petioles 5-6 mm long, canaliculate, amplexicaul, ciliate; pedicels shorter than leaves, slender, glabrous; flowers azure, solitary, axillary, 20-30 mm in diameter; calyx segments linear, 6 mm long, more than half the length of corolla tube, acute, sparsely long-ciliate; corolla tube 10-15 mm long, abruptly enlarged in upper part, densely hairy within; corolla lobes 10-15 mm long, 7-8 mm broad, obovate, obliquely truncate; pockets in corolla throat broad, obtriangular, alternate with the lobes, without teeth on the sides; anthers in upper part of corolla tube, as long as filaments; connectives connivent about the stigma, terminating on the back in a tuft of white hairs; filaments inflexed, gradually narrowed and geniculate below; follicles oblong, 2-2.5 cm long, slightly arched-recurved, glabrous or pubescent, the dorsal suture prolonged into a point 4-5 mm long; seeds cylindric, 1-1.2 cm long, brown, alveolate-rugose by prominent elongated light brown tubercles. March-June.

Shady woods of the maritime zone. — Caucasus: W. Transc. **Gen. distr.:** Bal.-As. Min. (Asia Minor). Described from Colchis. Type in Paris.

Note. Only one of the samples from the Caucasus studied by us belongs to **V. major** (sample collected by Overin in Mushtanda, probably naturalized or cultivated); the others belong to **V. pubescens** Urv. — undoubtedly a Caucasian species, penetrating into adjoining Turkey. The pubescence of stem, leaves and follicles varies in **V. pubescens**, though in most species it is much pronounced than in the West European species **V. major** L. which apparently does not occur in wild state in the USSR.

3. **V. major** L. Sp. pl. (1753) 209, Engl. Bot. tab. 514; DC. Prodr. VIII, 384; Ldb. Fl. Ross. III, 42; Boiss. Fl. or. IV, 45; Shmal'g. Fl. II, 206; Grossg. Fl. Kavk. III, 233. — **V. grandiflora** Salisb. Prodr. (1796)

146. — *V. ovatifolia* Stokes, Bot. Mat. Med. I (1842) 497. — Ic.: Rchb. Ic. Fl. Germ. XVIII, tab. 1062, 1063. — Exs.: Fl. Ital. No. 624; Fl. Sicula, No. 799; Fl. Gall. et Germ. No. 895, No. 1037.

Perennial; stem glabrous or very sparsely hairy; leaves ovate, 4-8 cm long, 2-5 cm broad, glabrous, ciliate-margined, often pubescent on the veins on both sides; flowers 30-50 mm in diameter; calyx segments 8-9 mm long, ciliate; corolla tube gradually enlarged upward; lobes 15-25 mm long, 10-18 mm broad, rhomboidally obovate; in other characters not differing from the preceding species. March-April.

A species occurring in the USSR as a cultivated or naturalized plant, in gardens and parks, rarely in woods. — European part: Crimea; Caucasus; E. Transc.; Soviet Central Asia (cultivated in many localities). **Gen. distr.:** W. Med., Bal.-As. Min. Described from France and Spain. Type in London.

4. *V. herbacea* Waldst. et Kit. Pl. Rar. Hung. I (1802) 8, tab. 9; DC. Prodr. VIII, 383; Ldb. Fl. Ross. III, 42; Shmal'g. Fl. II, 206; Grossg. 650 Fl. Kavk. III, 233; Maevsk. Fl. ed. 7, 580. — *V. pumila* Clarke, Trav. IV (1813-1823) 553. — *V. mixta* Velen. Fl. Bulg. (1891) 646. — Ic.: Waldst. et Kit. l.c.; Bot. Mag. XIV (1818) tab. 2002. — Exs.: GRF, No. 827; Fl. pol. exs. No. 850; Fl. Cechoslov. No. 33; Fl. Hungar. No. 398; Fl. exs. Austro-Hung. No. 2199.

Perennial; stems trailing, not rooting; flowering shoots ascending, glabrous; leaves elliptic, 3-4 cm long, 1-1.5 cm broad, acute, cuneate at base, deciduous before winter, the margin and veins on both sides rough; pedicels glabrous, exceeding the leaves; flowers violet to bluish-violet, axillary; calyx segments linear-lanceolate, 7 mm long, reaching the middle of corolla tube, glabrous; corolla 15-18 mm in diameter; corolla tube 10-15 mm long, abruptly enlarged at the middle, densely pubescent; lobes 12-18 mm long, 3-5 or rarely to 10 mm broad, elliptic, acutish, obliquely truncate; pockets in throat narrow, triangular, alternate with corolla lobes; stamens adnate to middle of corolla tube; filaments dilated, gradually narrowed toward base and geniculate; anthers oblong, as long as the dilated filaments; connective galeiform, with two tufts of long white hairs on the back; follicles oblong, 3-4 cm long, 0.4-0.5 cm broad, arched-recurved, slightly prolonged into a thick obtuse tip; seeds dark brown, cylindric, oblong, with raised tubercles. March-June.

Scrub, wood margins, steppes, steppe mountain slopes, and chalk outcrops. — European part: V.-Don, U. Dns., M. Dnp., L. Don, Bes., Bl., Crim.; Caucasus: Cisc., Dag., W., E. and S. Transc.; Soviet Central Asia: cultivated in many places. **Gen. distr.:** Centr. Eur., Bal.-As. Min., Arm.-Kurd. Described from W. Europe. Type in Budapest.

Note. Most widely distributed of all known species of the genus *Vinca*. Widely polymorphic. De Candolle recorded, from regions of USSR, *f. pusilla* with small flowers. E.I. Bordzilovskii noted in the herbarium of the Botanical Institute of the Academy of Sciences of the USSR two forms from the Ukraine: *f. macrantha* with large flowers and *f. micrantha* with small flowers, the two forms occurring in the same area.

Section 2. *Vincopsis* Pobed. in Addenda XVII, 752. — Corolla pale azure or rose, with violet tube; throat hairy; stamens inserted at the middle of tube; leaves sessile; stems erect, simple, brittle.

5. *V. erecta* Rgl. et Schmalh. in Tr. Bot. sada, VI (1879) 330.—
V. herbacea var. *libanotica* Pichon in Bull. Mus. Nat. Hist. Nat.
ser. 2, XXIII, 4 (1951) 440, p.p.

Perennial; rootstock ligneous, horizontal, covered with scales; roots firm,
651 stringy; stems erect, simple, two to many from common rootstock,
30-40 cm long; leaves elliptic or ovate to suborbicular, 4-5 cm long,
2-2.5 cm broad, narrowed at both ends, acute, glabrous or densely covered
on the margin and on the whole surface with very short hairs (var. *hirsuta*
B. Fedtsch. in herb.), sessile, with several prominent longitudinal veins;
flowers solitary in leaf axils; pedicels 3-5 cm long, shorter than leaves,
glabrous or densely hairy (var. *hirsuta*), contorted in fruit; flowers large,
pale azure or white within, rose outside, the tube violet; calyx segments
7.5-10 mm long, half or more than half the length of tube, linear-lanceolate,
ciliate or rather densely hairy; with thickish oblong teeth at base; corolla
tube 15-20 mm long, narrow, abruptly enlarged about the middle, densely
hairy within in upper part; corolla lobes elliptic, obovate or oblong, acute
to obtusish, glabrous or the margin short ciliate at apex; stamens inserted
at the middle of tube; anthers oblong, broad, half as long as the dilated
part of filament; filaments inflexed, gradually narrowed toward base,
geniculate at point of insertion; connective galeiform, dorsally white-
bearded at apex; follicles 3-5 cm long, 0.6-0.7 cm broad, oblong, short-
acuminate, terminating in a point recurved toward dorsal suture,
longitudinally striped, glabrous or densely hairy (var. *hirsuta*); seeds
few, 1-3 per follicle, cylindric, 12-13 mm long, brown to cinnamon-
colored, densely and coarsely tuberculate, the longitudinal furrow enlarged
at base. Fl. March-April; fr. May-June (Plate XXXV, Figure 6).

Stony and gravelly mountain slopes, rocks, and sometimes juniper thickets.—
Soviet Central Asia: T. Sh. Pam.-Al. Endemic. Described from the Maili
River in the Fergana Valley. Type in Leningrad.

Note. Specimens from Shakhimardan and some other localities have
been found to differ from those of *E. Fergana* whence the species was
described. Stems are numerous and short, leaves thin and not coriaceous,
flowers many, and corolla lobes narrower. It is possible, however, that
all these characteristics of the Shakhimardan plants are merely due to age
difference. We have not seen any fruiting specimens from this area, whereas
most specimens from *E. Fergana* were in fruit or after flowering.
Moreover, some specimens from Shakhimardan resemble the type. Some
herbarium specimens from Pamir-Alai are also fully identical with the
Shakhimardan plants, and this would also point to differences of age or
possibly of ecological conditions that are difficult to determine because of
inadequately documented material. B. A. Fedchenko found herbarium
652 records of several forms: var. *hirsuta* Fedtsch., a form hairy throughout;
var. *glabra* Fedtsch, a form devoid of vestiture; var. *bucharica*
(*V. herbacea* var. *herbacea* Pichon, l.c. 441, p.p.), a large-
flowered form from Pamir-Alai. These forms are not geographically fixed.

Subfamily 2. **ECHITOIDEAE** Schum. in Engl.—Pr. Pflanzenf. IV, 2
(1895) 122.—Stamens firmly attached to the thickened stigma; anther cells
sagittate, always appendaged, not completely filled with pollen in outer part;
seeds comose.

Genus 1164. **TRACHOMITUM*** WOODSON

Woodson in Ann. Miss. Bot. Gard. XVII (1930) 157; Pichon in Bull. Mus. Nat. Hist. Nat. ser. 2, XX, 3 (1948) 299.—*Apocynum* L. Sp. pl. (1753) 213, quoad pl. euroas.

Calyx deeply 5-parted; corolla cylindric to cylindric campanulate, 5-parted to about the middle, densely glandular-pubescent on both surfaces, with 5 short subulate cartilaginous appendages at base, opposite corolla lobes; stamens 5, connivent above the style, the inner side of anthers fused with the broadest part of stigma; anthers oblong, narrowed upward, the protrusion of connective membranous, acute; filaments short, dilated, not fused, inserted at corolla base; ovary of two distinct carpels, with a common biconical stigma, subinferior; disk annular, 5-lobed; follicles 2, long and slender, cylindric, dehiscent along the ventral suture; seeds numerous, small, oblong, with a coma of long slender hairs. Perennial herbs or subshrubs; leaves opposite or the upper ones sometimes alternate; inflorescence monochasial, terminal.

A Eurasian genus; composed at present of 6 species.

1. Inflorescence a few-flowered corymb at the ends of stem and branches, never paniculate; bark of stem bright red (Dzharylgach Island) 2. **T. Russanovii** Pobed.
- + Inflorescence paniculate, commonly on main stem and sometimes on branches 2.
2. Leaves scabrous by short cartilaginous teeth on the margins and on midrib underneath 3.
- 653 + Leaf margin smooth or sparsely crenate 4.
3. Leaves oblong-linear, acute (Caucasus) 4. **T. armenum** Pobed.
- + Leaves elliptic or oblong, obtuse, mucronulate (Soviet Central Asia). 6. **T. scabrum** (Russan.) Pobed.
4. Corolla broadly campanulate, parted to the middle; bark of stem light brown; seeds coarsely oblongly alveolate (N. and Centr. part of Soviet Central Asia, Siberia, Altai) 5. **T. lancifolium** Russan.
- + Corolla narrowly campanulate, parted to one-third; bark brown or reddish-brown; seeds finely tuberculate 5.
5. Leaves elliptic, rarely oblong, 3-4.5 cm long, 1.5-2 cm broad, obtuse to short-acuminate; calyx segments 1.5-2 mm long, 0.75-1.2 mm broad, obtusish 1. **T. sarmatiense** Woodson.
- + Leaves elliptic-oblong, 4-7 cm long, 0.8-1.5 cm broad, acute; calyx segments 2 mm long, 0.5 mm broad, acute. 3. **T. tauricum** Pobed.

1. **T. sarmatiense** Woodson in Am. Missouri Bot. Gard. XVII (1930) 162.—*Apocynum sibiricum* Pall. ex R. Br. in Mem. Wern. Soc. I (1809) 68, non Jacq.; Roem. et Schult. Syst. IV, 405; Rusan. in Tr. Inst. nov. lub. syriya, VII (1933) 43.—*A. syriacum* Gmel. Reise, II (1774) 198, 257, nom. nud.—*A. venetum* Ldb. Fl. Ross. III (1846) 43, p. p.; Grossg. Fl. Kavk. III, 234.—*A. venetum* γ. *ellipticifolium* Bèg. et Bel. in Mem. Acad. Lincei, ser. V, IX (1913) 75.—*A. venetum* ♀. *anomalum* Bèg. et Bel. l.c. 76.—*A. venetum* L. var. *wolgense* Fischer ex Bèg. et Bel. l.c. 72, nomen.—*Nerium sibiricum* Medic. Beobacht. (1782) 15.—*N. antidysertericum* Lepech. Putesh. I

* From Greek *trachys* = rough, and *miton* = thread, probably in allusion to the hairy pedicels.

(1774) 270, nomen.—Ic.: Ldb. Ic. Pl. Ross. III (1831) tab. 240; Rusan. 1. c. Figs. 4 and 14.

Perennial; stem ca. 100 cm long, erect, with reddish-brown bark, bearing branches of first and second, rarely third, order; lower branches arising at right angle, then ascending; leaves elliptic or rarely oblong, 3-4.5 cm long, 1.5-2 cm broad, obtuse to short-acuminate, round-tipped, glabrous at base, the margin scaberulous-serrulate; inflorescence a compact panicle composed of corymbs, short, mostly few-flowered, at the end of stem and upper branches; flowers rose, 6-8 mm long; bracteoles hyaline, lanceolate, 1-3 mm long; bracteoles, pedicels and calyx covered with short white hairs; calyx segments lanceolate, 1.5-2 mm long, 0.75-1.2 mm broad, obtusish, violet; corolla parted to one-third, densely glandular-pubescent on both surfaces, reddish-striped; corolla lobes erect, oval, 2.25-2.5 mm long and 2-2.2 mm broad, obtuse or round-tipped; filaments of stamens long, included in corolla tube and not reaching the base of lobes; anthers 2-2.25 mm long, the lobes exceeding anther length, with a ventral excrescence adherent to stigma, the hyaline appendage of anther lanceolate, acute, 0.5 mm long, filaments dilated, short; stigma in the shape of two conuses joined by their bases, the base of the upper conus 5-angled with depressions on the angles for adhesion of anthers; ovary short-hairy at base; follicles linear, terete, 10-18 cm long, 0.3-0.4 cm broad, slightly attenuated, bare at apex; seeds very small, 2 mm long, brown, subcylindric, slightly narrowed below, finely tuberculate. June-August.

River valleys, floodplains sandy solonetz.—European part: E. Don, Transv., Bl., Crim., L. Don, L. V.; Caucasus: Cisc., E. and S. Transc. Endemic. Described from the Lower Volga region. Type in London.

Economic importance. The plant yields good light-colored long and firm fiber. The leaves contain rubber, but the plant is not considered nowadays as an economic rubber plant.

Note. A form occurring in Dagestan differs from the type in pubescent leaves, and a form with very narrow leaves was collected in Pyatigorsk. A polymorphic species. Berlyand and Borisov in their study on *Trachomitum* (Tr. Inst. nov. lub. syr'ya, I, 1931) established 32 varieties; these, however, are of no systematic value.

2. **T. Russanovii** Pobed. comb. n.—*Apocynum Russanovii* Pobed. in Bot. Mat. Gerb. Bot. inst. AN SSSR, XI (1949) 129.

Perennial; stems 70-80 cm long, bright red, branched, densely leafy; branches of first and second order, ascending; leaves petiolate, ovate or oval, 2-4 cm long, 2-2.5 cm broad (f. *latifolium* Illicz.) or oblong, 3-3.5 cm long, 0.8-1 cm broad (f. *angustifolium* Illicz.), glabrous, obtuse, short-acuminate, rounded at base; corymbs few-flowered, at the ends of main stem and of nearly all branches; bracteoles small, narrow, hyaline-margined; bracteole, pedicel and calyx short-pubescent; flowers 4.5 mm long, rose, parted to one-third, densely glandular-pubescent on both surfaces; calyx segments broad, obtuse, 0.75-1 mm long, 0.5-0.75 mm broad, greenish; corolla lobes oval, obtuse, 1.5 mm long, 1.25 mm broad; anthers, stigma and ovary as in the preceding species; glands of hypogynous disk broader than in *T. sarmatiense*; follicles linear, cylindric, 10-15 cm long, 0.4-0.5 cm broad, somewhat attenuate at apex, glabrous; seeds narrowed toward base, brown, tubercular (Plate XXXV, Figure 4).



Plate XXXV

1. *Trachomitum armenum* Pobed.—2. *T. tauricum* Pobed.—3. *Poacynam pictum* (Schrenk) Baill.—4. *Trachomitum Russanovii* Pobed.—5. *Poacynum Hendersonii* (Hook. f.) Pobed.—6. *Vinca erecta* Rgl.

Swampy depressions among reed and wet saline meadows.— European part: Bl. (Dzharygach Island). Endemic. Described from Dzharygach Island. Type in Leningrad.

3. **T. tauricum** Pobed. comb. n.—*Apocynum tauricum* Pobed. in Bot. Mat. Gerb. Bot. inst. AN SSSR, XI (1949) 130.

Perennial; stem to 1 mm long, glabrous, brown, few-branched; branches only of first and second order, ascending; leaves elliptic-oblong, 4-7 cm long, 0.8-1.5 cm broad, the upper linear, attenuated at apex, acute, cuneate or almost rounded at base, denticulate-crenulate, petiolate; corymbs few-flowered, at the end of main stem and of upper branches; peduncles and pedicels glabrate, bracteoles linear, 9-10 mm long, the lower herbaceous, the upper hyaline-margined; bracteoles and calyx slightly pubescent; flowers 7 mm long; calyx segments 2 mm long, 0.5 mm broad, broadly hyaline-margined, acute, nearly reaching the base of corolla lobes; corolla parted to about the middle, densely glandular-pubescent on both surfaces, narrow, 2.5-3 mm long, 1 mm broad, slightly enlarged toward apex, obtuse or round-tipped, half the length of tube; follicles unknown. June (Plate XXXV, Figure 2).

Coastal mountain slopes.— European part: Crimea. Endemic. Described from vicinity of Feodosiya. Type in Leningrad.

4. **T. armenum** Pobed. comb. n.—*Apocynum armenum* Pobed. in Bot. Mat. Gerb. Bot. inst. AN SSSR, XI (1949) 131.—*A. venetum* var. *angustifolium* Bordz. in herb.—*A. venetum* var. *oblongifolium* Bèg., var. *longifolium* Bèg., var. *anomalum* Bèg. ex Bèg. et Bel. in Mem. Acad. Lincei, ser. V, IX (1913) 71, 76, p.p.

Perennial; stem 1.5 m long, reddish, branched; branches of first order, ascending; leaves oblong-linear, the upper linear-lanceolate, 3-7 cm long, 0.8-1.2 cm broad, acute, almost rounded or cuneate at base, glabrous or rough-pubescent, the margin scabrous-dentate, the midrib prominent, the lateral veins faint; inflorescence paniculate, consisting of few-flowered corymbs at the end of the main stem and upper branches; bracteoles ovate to lanceolate, 1-4 mm long, hyaline-margined, pubescent, rarely glabrate; flowers 5-8 mm long, densely glandular-pubescent on both surfaces; calyx segments broadly ovate, 1-2.5 mm long, 0.75-1 mm broad, narrow, acute, half the length of corolla tube, pubescent; corolla parted to one-third or lower down; corolla lobes 2-3.5 mm long, 1.2-2 mm broad, oblong, obtuse; follicles linear, terete, 18-20 cm long; fruit unknown [?]. June-July (Plate XXXV, Figure 1).

River valleys in mountain areas.— Caucasus: S. Transc. Gen. distr.: Arm.-Kurd., Iran. Described from S. Transcaucasia (Surab). Type in Leningrad.

5. **T. lancifolium** (Ruslan.) Pobed. comb. n.—*Apocynum lancifolium* Ruslan. in Tr. Bot. inst. AN SSSR, ser. 1, I (1933) 167; Tr. Inst. nov. lub. syr'ya, VII, 44; Kryl. Fl. Zap. Sib. IX, 2206.—*A. sibiricum* Ldb. Fl. alt. I (1829) 235, non Pall.—*A. venetum* Ldb. Fl. Ross. III (1846-1851) 43, p.p.; Kryl. Fl. Alt. III, 827.—*A. sibiricum* f. *longifolium* Bèg. et Bel. in Mem. Acad. Lincei, ser. V, IX (1913) 71.—*lancifolium* Ruslan. in Tr. Inst. nov. lub. syr'ya, VII, Figures 3, 6, 8, 9, 11, 15, 17.

Perennial; stem 80-120 cm long, terete, glabrous, light brown, with long internodes, branched in upper part, the branches more or less ascending; leaves opposite, at the ramifications of stem alternate, oblong to lanceolate, 2-6 cm long, 0.5-2 cm broad, obtuse, mucronulate, pinnately nerved, glabrous, the margin minutely cartilaginous-denticulate, the petiole 3-4 mm long; inflorescence spreading, paniculate, at the ends of main stem and upper branches; peduncles 8-15 cm long, glabrous, the flowers confined to their forked ends; pedicels shorter than or as long as flowers; bracteoles small, hyaline, lanceolate, slightly pubescent; calyx segments oblong, acutish, 2 mm long, the margin broadly white-hyaline, both surfaces short-pubescent; corolla broadly campanulate, pink, densely beset with short glands, 6-8 mm long, parted to the middle; corolla lobes ovate, obtuse, round-tipped, 1 mm long, 3 mm broad; anthers, pistil and hypogynous glands as in other species; filaments of stamens with a tuft of white hairs at the top; follicles cylindric, slightly attenuate at the top, 12-20 cm long, 0.3-0.4 cm broad, brown, glabrous; seeds oblong, 2 mm long, brown, coarsely alveolate with oblong pits. Second half of June to first half of August.

Sandy, pebbly, gravelly, or stony slopes along river banks, and Solonetz sites.—W. Siberia: Irt., Alt.; E. Siberia: Ang.-Say., Dau.; Soviet Central Asia: Ar.-Casp., Balkh., Kyz. K., Syr D., T. Sh. **Gen. distr.:** Dzu.-Kash., Mong., N. China. Described from Ili River. Type in Leningrad.

659 Note. *T. lancifolium* varies throughout its distribution area chiefly in shape and vesture of leaves. In the Kara-Kalpak ASSR and in Karaganda, there are forms of *T. lancifolium* with very narrow leaves resembling those of *Poacynum pictum*; specimens collected by the Sary-su River have slightly pubescent (not glabrous) leaves. Specimens from N. China do not apparently belong to this species.

6. *T. scabrum* (Ruslan.) Pobed. comb. n.—*Apocynum scabrum* Ruslan. in Tr. Bot. inst. AN SSSR, ser. 1, I (1933) 166; in Tr. Inst. nov. lub. syr'ya, VII, 44.—*A. venetum* var. *scabrum* Bèg. et Bel. in Mem. Acad. Lincei, ser. V, IX (1913) 76.—Ic.: Ruslan. in Tr. Inst. nov. lub. syr'ya, VII, Figs. 5, 7, 10 and 12.—Exs.: GRF, No. 1030.

Perennial; stem up to 2 m long, reddish-brown, glabrous or scabrous by scattered short crenulations, profusely branched; branches mostly of first order, alternate or opposite; leaves elliptic to oblong, 3-6.5 cm long, 0.5-2.5 cm broad, obtuse, mucronate, the margin and lower surface strongly roughened by short firm cartilaginous excrescences; inflorescence an open panicle at the end of stem and upper branches; peduncles 8-15 cm long, glabrous or scaberulous; flowers confined to corymbs at the ends of these peduncles; bracteoles small, hyaline, lanceolate; bracteoles, pedicel and calyx covered with short white hairs; flowers pink, broadly campanulate, 6-7 mm long, densely beset on both sides with short glands; calyx reddish; calyx segments broadly triangular, 1-1.5 mm long, 0.8-1 mm broad, acute, the margin broadly white-hyaline; corolla parted to one-third or nearly to the middle; corolla lobes obtuse, almost round-tipped, 2-2.5 long and 2-2.2 mm broad; filaments bare; ovary white-bearded at the top; follicles 14-17 cm long; seeds 3 mm long, otherwise as in the preceding species. July- mid August.

Riverbanks, floodplains, wet meadows, and alluvial soils.— Soviet Central Asia: Ar.-Casp. (Mangyshlak), Kuz. K., Kara K., Pam.-Al., Mtn. Turkm. **Gen. distr.**: Iran. Described from Amu Darya. Type in Leningrad.

Note. Specimens occurring in Ust-Urt have broad and much longer leaves than those of the typical form, either hairy or glabrous. Among plants collected in Turkmenistan in the Kara-Kala area and in Kopet Dag, also in Pamir-Alai on the Pyandzh R., in Karategin, on the Vakhsh R. and in Darwaz, beside pubescent specimens, there are also specimens with leaves completely glabrous, devoid of dentation on the margin and more elongated (f. *glabrum* Pobed.). The absence of pubescence also occurs in Bukhara (coll. Nevesskii). It is noteworthy that in the Himalayas (Kashmir, Gilgit) and in Afghanistan, *A. scabrum* also has glabrous and smooth-margined leaves.

660

Genus 1165. **POACYNUM** * BAILL.

Baill. in Bull. Soc. Linn. Paris, I (1888) 757; ej. Hist. de pl. (1891) 208; Schum. in Engl.—Pr. Pflanzenf. IV, 2 (1895) 179; Woodson in Ann. Missouri Bot. Gard. 17 (1930) 165; Pichon in Bull. Mus. Nat. Hist. Nat. ser. 2, XX, 3 (1948) 299.

Calyx 5-parted; corolla salverform, 5-parted, the 5-basal appendages opposite corolla lobes and alternate with stamens; stamens 5, resembling those of *Trachomitum*; nectaries forming an annular hypogynous disk; ovary superior. Shrubs with alternate leaves and nodding flowers. In other characters identical with *Trachomitum*.

A genus containing but two species, distributed in Soviet Central Asia and Central** Asia.

1. Leaves linear, 3-6 cm long, 0.3-0.5 cm broad; calyx segments lanceolate, narrow; flowers 1-1.5 cm in diameter 1. **P. pictum** (Schrenk) Baill.
- + Leaves elliptic, 3-5.5 cm long, 1-1.5 cm broad; calyx segments triangular, broad; flowers 2-2.5 cm in diameter 2. **P. Hendersonii** (Hook. f.) Woodson.

1. **P. pictum** (Schrenk) Baill. in Bull. Soc. Linn. Paris, I (1888) 757; Schum. in Engl.—Pr. Pflanzenf. IV, 2, 179.—*Apocynum pictum* Schrenk in Bull. Phys. math. Acad. Petersb. II (1844) 115; Ldb. Fl. Ross. III, 1, 43; Bèg. et Bel. in Mem. Acad. Lincei, ser. 5, IX (1913) 77.—*A. sibiricum* var. *salsuginosum* Russan. Kendyr' v doline Ili [Poacynum in] (1930) 20.—Ic.: Bèg. et Bel. l.c. f. 3.

Perennial; stem 0.5-1 m long, herbaceous, woody at base, light green, few-branched; branches appressed to stem; leaves linear, 3-6 cm long, 0.3-0.5 cm broad, slightly attenuated toward apex, cuneate at base, cartilaginously crenate-margined, initially the veins and the surface chiefly underneath scabrous, glaucescent, the petiole 3-4 mm long; racemes and corymbs gathered in paniculate inflorescences at the end of stem and branches; bracteoles lanceolate, 2-3 mm long, hyaline-margined; bracteole, pedicel and calyx densely covered with short white hairs; pedicels 4-5 mm long, arched recurved; flowers pendent, rose, salverform,

* Anagrammatic version of *Apocynum*.

** [Approximately Mongolia and western China.]

0.5-0.7 cm long and 1-1.5 cm broad; calyx very short, the segments narrow lanceolate; corolla parted to about the middle; corolla lobes broad, obtuse, dark red-striped, beset on both sides with minute glands; stamens inserted at base of corolla, the filaments shorter than anthers; anthers not reaching the base of corolla lobes, acute, sagittate, with long reflexed lobes, the
661 minute appendages in the middle part firmly fused with the broadest middle part of stigma; ovary of two closely adherent carpels; style very short, obsolescent; stigma in the shape of two cones joined at base, the upper apex acute, 2-lobed; follicles ca. 20 cm long, very narrow, glabrous; seeds brown, 4-5 mm long, 0.5-1 mm broad, compressed, somewhat enlarged and rounded at base, with a long yellow coma at the top. May-August (Plate XXXV, Figure 3).

Sandhills, solonchaks, and river valleys. — Soviet Central Asia: Ar.-Casp., Balkh.; **Gen. distr.:** Dzu.-Kash. Described from Mt. Tamgali-tas on the Chu River. Type in Leningrad.

Note. F.N. Rusanov recorded in the herbarium the form *f. convallariaeflorum* which he had collected on solonchaks in the middle course of the Ili River.

2. **P. Hendersonii** (Hook. f.) Woodson in Ann. Missouri Bot. Gard. 17 (1930) 167. — *Apocynum Hendersonii* Hook. f. in Henders. et Hume, Lahore to Jarkand (1873) 327; Bèg. et Bel. in Mem. Acad. Lincei, ser. 5, IX (1913) 78. — *A. grandiflorum* P. Danguy in Bull. Mus. Nat. Hist. Nat. 5 (1911) 340; in Lecomte, Not. system. II, 5, 137. — Ic.: Henders. et Hume, l.c. 327; Bèg. et Bel. l.c.f. 4.

Perennial; stem erect, 50-100 cm long, woody at base, terete, slightly sulcate, smooth, profusely branched; branches long, strict; leaves alternate, elliptic, 3-5.5 cm long and 1-1.5 cm broad, obtuse or mucronate, slightly tapering at base, glabrous, scabrous-margined by cartilaginous denticulation, the upper leaves narrower and scabrous all over, all glaucous, short-petioled, palmately veined; petiole 5-6 mm long; inflorescence a panicle composed of corymbs or racemes, spreading, at the ends of stem and branches; pedicels 5-8 mm long; pedicel, bracteole and calyx densely covered with short white hairs; bracteoles narrow, lanceolate, 2-3 mm long, early caducous; flowers white, dark red-striped, fragrant, large, 0.5-1 cm long, 2-2.5 cm broad, nodding, salverform; calyx very small, deeply parted; calyx segments broadly triangular, acute, 2-2.5 mm long, 1-1.5 mm broad; corolla parted to one-third; corolla lobes broad, obtuse, 0.5-0.8 cm long, densely beset on both sides with short glands; stamens and style as in the preceding species; follicles linear, 15-30 cm long, 0.5-0.7 cm broad, pointed at the end, glabrous; seeds resembling those of *P. pictum*. June-July (Plate XXXV, Figure 5).

Mountain slopes, river valleys, solonchaks, rarely sands. — Soviet Central Asia: Balkh, (only the middle course of the Ili R.), Pam.-Al. (Alai foothills). **Gen. distr.:** Kuldja, Mong., Dzu.-Kash., Tib., N. China. Described from Yarkand. Type in London.

662 Note. This species is widely distributed in Central Asia: It is very rare in the USSR, where it is represented by nontypical specimens which diverge from the Soviet Central Asian *P. Hendersonii* and from the Middle Asian *P. pictum*.

Genus **NERIUM** * L.

L. Sp. pl. (1753) 209.

Calyx 5-parted; calyx segments linear-lanceolate, with numerous glands at base within; corolla infundibular, with five lobes and a long narrow tube, the throat with five ligulate and more or less toothed appendages opposite the lobes; stamens inserted at the middle of corolla tube, with ligulate filaments; anthers longer than filaments, sagittate, 2-tailed at base, terminating in elongated spirally twisted bristles, the middle part fused with stigma; style undivided; stigma obtuse; follicles two, appressed; seeds numerous, comose. Shrubs with milky sap; leaves opposite or ternate; inflorescence terminal; flowers showy.

The genus contains 5-8 species, distributed through the Mediterranean region and subtropical Asia (to Japan). Only one species cultivated in the USSR.

Nerium volynicum Stanisl. in the Eocene of U. Dnp. (Volyanshchina).—*Neritium majus* Ung. in the Eocene Buchak layers of U. Dnp. (Tim).

1. **N. oleander** L. Sp. pl. (1753) 209; DC. Prodr. VIII, 420; Boiss. Fl. or. IV, 47.—Ic.: Rchb. Ic. fl. Germ. XVII, tab. 23.

Shrub; stem much branched; branches firm, straight, strict; leaves numerous, coriaceous, narrowly lanceolate, 9-14 cm long, 1-2.5 cm broad, acute, slightly attenuated toward base, short-petioled, the midrib prominent, the lower surface pubescent; flowers in corymbiform cymes, the pedicel and calyx tomentose; corolla rose, with spreading lobes; corolla appendages 3- or 4-toothed, the teeth lanceolate, acute, unequal, exserted from the throat; stamens bristly-pubescent; anthers dorsally plumed, about twice the length of filament, reaching or overtopping the throat. Fl. June-July; fr. September.

Widely cultivated in the Crimea, in the Caucasus, and in the southern part of Soviet Central Asia. Growing wild along the Mediterranean seaboard (in Europe, Africa and Asia) and in Iran. Described from Crete. Type in London.

Economic importance. Ornamental grown for ornament in gardens, parks, and streets of the Crimea and the Caucasus; in more northerly latitudes grown indoors.

363

Family CXXXIII. **ASCLEPIADACEAE** LINDL. **

Calyx 5-parted, persistent; corolla gamopetalous, hypogynous, regular, deciduous, rotate or campanulate, the throat enlarged by a corona formed by appendages of anthers more or less united into a tube; stamens five, inserted at the base of perianth, the filaments nearly always connate in a tube including the pistil (gynostegium) or rarely distinct; anthers straight, biloculate, sometimes elongated, adherent to stigma, the connective often apically enlarged into membranous appendages; styles two, connate at apex; stigma one, pentagonal, with red stigmatic bodies [corpuscles, glands] at

* From Greek *neros* = moist, alluding to the places in which it grows wild.

** Arranged by E. G. Pobedimova.

angles alternating with anthers; pollen coherent in pollinia, these commonly ten in number, fixed to the glands by a brace [translator arm, retinaculum] or the pollen in tetrads on spoon-shaped containers (in the USSR only in species of the subfamily Periplocoideae). Ovaries two, with numerous ovules; placenta attached to ventral sutures; follicles two or single by abortion of one of the pair; seeds always with a long coma. Herbs or subshrubs with erect or trailing stems and opposite leaves, often with milky sap.

The family contains at least 256 genera, comprising more than 1500 species, distributed chiefly through the tropics. Nine genera, with 40 species, occur in the USSR, reaching up to 61° N.

Genus **ACERATES**

Acerates veterana Heer in the Eocene of U. Dnp. (Yablonsky) and in upper Oligocene of Transc. (Tori).

Key to Genera

1. Pollen grains united in tetrads; pollination apparatus spoon-shaped; scales of corona awned 1166. **Periploca** L.
- + Pollen grains united in pollinia suspended by a slender translator arm on a red corpuscle [gland]; scales of corona awnless 2.
2. Corolla tubular, the tube enlarged at base; scales of corona fleshy, adnate to corolla tube ***Araujia** Brot.
- + Corolla rotate; scales of corona affixed to gynostegium 3.
3. Corona membranous, consisting of hooded scales or tubular; follicles prickly 4.
- 664 + Corona fleshy (very rarely scales of corona membranous — section *Rhodostegioides* of the genus *Vincetoxicum*); follicles smooth or covered with short hairs 8.
4. Corona with hooded scales 5.
- + Corona tubular or deeply cleft 6.
5. Scales of corona with two teeth at angles; corolla lobes ciliate; follicles with soft prickles 1167. **Gomphocarpus** R. Br.
- + Scales of corona with a horn-shaped appendage projecting from the hood toward the stigma; corolla lobes covered on the outside with crisped white hairs; follicles whitish from dense short soft tomentum, with scattered stiff prickles 1168. **Asclepias** L.
6. Tip of anthers tubular, overtopping the gynostegium 7.
- + Tip of anthers not tubular, deeply parted 8.
7. Tip of anthers plaited, with short acute divisions, not appendaged inside; stems erect; flowers large, pink 1172. **Cynoctonum** E. Mey.
- + Tip of anthers appendaged outside and inside, rarely unappendaged; stems twining; flowers small, whitish within, pink outside 1174. **Cynanchum** L.
8. Stigma conical, short or long, 2-beaked at apex 9.
- + Stigma broad, flattened 10.

9. Stigma filiform, 6 mm long, exserted; corona very short, fleshy, affixed to the short gynostegium; corolla lobes whitish within 1170. **Metaplexis** R. Br.
- + Stigma thick, short, included in flower; corona membranous, with large broad scales; corolla lobes short-pubescent within 1173. **Seutera** Rchb.
10. Scales of corona distinct, crescent-shaped, thick, fused with gynostegium as well as with anthers; leaves linear; stems, peduncles, pedicels and leaf petioles glabrous 1169. **Pycnostelma** Bge.
- + Corona cup-shaped, rather deeply parted, with erect scales; leaves ovate or elliptic, and if linear then scales of corona scarious; stems, peduncles, pedicels and leaf petioles hairy 1171. **Antitoxicum** Pobed.

Subfamily 1. **PERIPLOCOIDEAE** K. Schum. in Engl. — Pr. Pflanzenf. IV, 2 (1895) 209. — Pollen grains in tetrads, adhering to a spoon-shaped corpuscle with a sticky disk at base; filaments of stamens distinct; anthers bearded on the back.

665

Genus 1166. **PERIPLOCA** * L.

L. Sp. pl. (1753) 211.

Calyx 5-parted; corolla rotate, the lobes spreading or reflexed, emarginate; scales of corona five, awned, included in the throat and alternate with corolla lobes; stamens five, with distinct filaments; anthers connate at apex, bearded on the back; pollen grains distinct or in tetrads, the arm of the carrier spoon-shaped at apex, connected with stigma; stigma obtuse, hemispherical; follicles terete, forked, smooth; seeds comose. Shrubs with twining stems.

The genus contains about 12 species, distributed through S. Europe, temperate and subtropical Asia, and tropical Africa. Two species of this genus occur in the USSR.

1. Leaves ovate or elliptic, obtuse or rarely acute; corolla lobes bearded on the margin from base; stigma capitate, fleshy 1. **P. graeca** L.
- + Leaves lanceolate or ovate-lanceolate, long-attenuate at apex, acute; corolla lobes bearded in lower part; stigma cuneiform 2. **P. sepium** Bge.

1. **P. graeca** L. Sp. pl. (1753) 211; Pall. Fl. Ross. II, 68, tab. 76; M.B. Fl. taur.-cauc. I, 176; DC. Prodr. VIII, 498; Ldb. Fl. Ross. III, 44; Boiss. Fl. or. IV, 49; Medv. Der. i kust. Kavk. 177; Shmal'g., Fl. II, 208; Grossg. Fl. Kavk. III, 235. — Ic.: Pall. l.c.; Bot. Mag. XXIII tab. 2289; Bot. reg. tab. 803. — Exs.: Herb. Fl. Cauc. No. 233; Billot, Fl. Gall. et Germ. No. 2108; Fl. Ital. exs. No. 1913; Schultz, Herb. norm. No. 524.

* From Greek peri = around, and plectein = to curl, entwine, as most species of the genus have twining stems.

Shrub; stems slightly twining, branched, the reddish-brown bark made granular by prominent lenticels; leaves rigid, ovate or elliptic, 6-10 cm long, 2.5-6.5 cm broad, short-acuminate, narrowed and rounded at base, glabrous, with a prominent midrib, short-petioled, the upper leaves smaller and narrower; umbels at the end of branches, loosely 2-6-flowered; bracts small, lanceolate, with scattered hairs; pedicels $1\frac{1}{2}$ -2 times length of flowers; peduncles and pedicels glabrous or sparsely hairy; flowers 1.5-2 cm in diameter, greenish-brown; calyx segments broadly ovate, hyaline-margined, glabrous, hairy outside at the middle; corolla lobes oblong, 0.8-1 cm long, obtuse, bearded on the margin from base, reflexed; 666 scales of corona alternate with corolla lobes, 2-auricled at base, prolonged from the middle into a long slender recurved awn; anthers elongated; pollen in tetrads, adhering to stigma at the enlarged corpuscle; follicles in pairs, 9-11 cm long, 0.7-0.8 cm broad, smooth; seeds reddish-brown, fusiform, 11 mm long, narrowly winged on one side. Fl. April-June; fr. May-August.

Shores of rivers and streams; wet places. — Caucasus: All regions.

Gen. distr.: W. and E. Med., Bal.-As. Min., Arm.-Kurd. Described from Syria. Type in London.

Economic importance. The bark contains tanning substances, gallic acid, sugar, fatty oils, tar, a bitter-almond-scented substance, and a glucoside periplocin, $C_{20}H_{43}O_{12}$. This glycoside has strong cardiotherapeutic properties, but nowadays it hardly finds any application in medicine. A poisonous plant. Often cultivated in gardens of Soviet Central Asia (Chardzhou, Ashkhabad, Samarkand), in the Crimea and in Kishinev.

2. **P. sepium** Bge. Enum. pl. Chinae bor. (1835) 43; DC. Prodr. VIII, 498; Maxim. Prim. Fl. amur. 474; Kom. Fl. Man'chzh. III, 282; Kom. and Alis. Oprod. rast. Dal'nevost. kr. II, 870. — Ic.: Kom. and Alis. l. c. 871.

Shrub; stem slightly twining, woody; bark brown, made granular by prominent lenticels; leaves rigid, oval to oval-lanceolate, 7-9 cm long, 1.5-2.5 cm broad, long-acuminate, glabrous on both sides, with a prominent midrib, short-petioled; cymes axillary, opposite, 3-5-flowered, borne on long glabrous peduncles; pedicels the length of flower, glabrous; flowers 1.2-1.5 cm in diameter, brownish-green; calyx segments broadly ovate, hyaline-margined, glabrous; corolla lobes oblong, 0.4-0.5 cm long, obtuse, bearded on lower half of margin, reflexed; scales of corona alternate with corolla lobes, 2-auricled at base, prolonged from middle part into a long slender recurved awn; anthers elongated; follicles in pairs, 10-12 cm long, 0.4-0.5 cm broad, smooth; seeds oblong-linear, 7-8 mm long, 0.5-1 mm broad, winged on one side, grooved on the other, sparsely covered with scattered short white hairs. Fl. May-June.

Hedges, roadsides, gardens; growing wild in valley scrub. — Far East: Uss.

Gen. distr.: N. China. Described from the vicinity of Peking. Type in Paris.

Subfamily 2. **CYNANCHOIDEAE** K. Schum. in Engl. — Pr. Pflanzenf. IV, 2 (1895) 209. — Pollen grains in pollinia, fixed by a gland; filaments of stamens connate; anthers bare on the back.

667 Tribe 1. **GLOSSONEMATINAE** K. Schum. l. c. 225. — Tip of anther attached to corolla tube.

Genus ***ARAUJIA** * BROT.

Brot. in Trans. Linn. Soc. XII (1818) 62.

Calyx segments ovate, acute, foliaceous, pubescent; corolla campanulate, the lobes rigidly upright, the tube enlarged at base; corona fused with corolla tube; scales of corona five, fleshy, ligulate, abruptly narrowed at base, hooded, appressed to the sessile gynostegium; stigma recurved; follicles thick, coriaceous, sometimes inflated, glabrous or covered with minute hairs. Twining shrubs, often leafy from base, with paired axillary cymes.

A South American genus (Brazil and Argentine), with 3 or 4 native species. Only one species cultivated and sometimes naturalized in the USSR.

1. **A. sericifera**; Brot. in Trans. Linn. Soc. XII (1818) 62; Tr. Tbil. bot. inst. XI (1947) 243. — *Physianthus albens* Mart. et Zucc. Nov. gen. et Sp. pl. (1824) 53. — Ic.: Brot. l. c. tab. 4-5; Mart. et Zucc. l. c. tab. 32.

Shrub; all parts densely covered with short white hairs; stems twining, twisted, yellowish-brown; leaves subdistant, 5-6 cm long, 2-3.5 cm broad, oblong-lanceolate, obtuse, mucronate, truncate to subcordate at base, nearly white beneath from dense pubescence, covered above with scattered raised hairs, the margins revolute; petiole 1.5-3 cm long; racemes few-flowered, the peduncles the length of leaves; bracts 0.5 cm long, oblong, hairy; flowers large; calyx parted nearly to base, half as long as corolla; calyx segments broadly ovate, acute, whitish from a dense coat of soft hairs; corolla lobes similarly vested, ovate, 0.5-0.8 cm long; tip of anthers with ovate inflexed acute appendages; anthers broader than long; pollinia ovoid, reticulate, suspended from broad translating arms, these constricted at the middle, embracing the gland and descending from it; gland elliptic, with two round auricles at the top; follicles oblong-ovoid, 10.5 cm long, 4 cm broad, obtuse. Fr. August-October.

Sandy seacoasts. — Caucasus: W. Transc. (between Sukhumi and Kelasuri), naturalized. Described from Peru. Type in London.

668 **Economic importance.** Grown for ornament along the Black Sea coast.

Tribe 2. **ASCLEPIADINAE** K. Schum. in Engl. — Pr. Pflanzenf. IV, 2 (1895) 230. — Corona attached to gynostegium; scales of corona distinct or connate merely at base; estivation valvate, rarely convolute.

Genus 1167. **GOMPHOCARPUS** ** R. Br.

R. Br. in Mem. Wern. Soc. I (1809) 37.

Calyx 5-parted; corolla deeply 5-parted, rotate; corona adnate much of its length to gynostegium; scales of corona five, scaphoid, 2-toothed on

* Named for the Portuguese Araujo, illustrator of the work in which the genus was first described.

** From Greek gomphos = needle and carpes = fruit — follicles seem to be covered by needles.

the margin, reflexed, glabrous or hairy, truncate or prolonged into appendages; anthers tipped by a membrane; pollinia attenuate at apex, appended, clavately compressed or in cultivated form rounded or obliquely truncate at base; stigma compressed, 5-angled, fleshy; follicles inflated, often angled; peduncles divergent; seeds comose. Subshrubs with opposite, often revolute leaves; peduncles borne between the petioles, few- to many-flowered.

About 100 species of this genus occur in central and southern Africa, which represents the center of distribution of the genus. There are about 10 species in Centr. and S. America and one species in Arabia. Only one naturalized species occurs in the USSR.

1. **G. fruticosus** (L.) R. Br. in Mem. Wern. Soc. I (1809) 38; Boiss. Fl. or. IV, 161; Grossg. Kavk. III, 235.—*Asclepias fruticosa* L. Sp. pl. (1753) 216.—Ic.: Bot. Mag. XXXIX, tab. 1628; Rchb. Ic. Fl. Germ. XVII, tab. 1071.—Exs.: Fl. cauc. exs. No. 525; Fl. Ital. No. 1914; Dörf. Herb. norm. No. 5135.

Shrub; stems erect, 40-60 cm long, few-branched, covered with short soft hairs, densely leafy; branches virgate, simple, strict; leaves linear, 7-10 cm long, 0.4-0.5 cm broad, acute, narrowed at base, revolute-margined, with a prominent midrib, both surfaces sparsely covered with short hairs, the petiole short; flowers few, in 4- or 5-flowered umbelliform inflorescences; peduncles borne between the upper leaves, shorter than leaves; peduncles, pedicels and calyx densely covered with short hairs; pedicels 4-5 times the length of flower; calyx segments acute, half the
669 length of corolla; scales of corona five, equal, broad, urceolately scaphoid, truncate and 2-toothed on the angles on both sides, one of the teeth oblong, obtuse, much longer, recurved, the other short, acute, erect; anthers elongated, the membranous tip small but nearly the breadth of anther, minutely toothed and curved at apex; pollinia clavate, 1.25-1.5 mm long; translator arms very short; glands oval, one-sixth to one-fifth the length of pollinium; follicles oblong-ovaloid, 6-7 cm long, 2-2.5 cm broad, pointed, covered by long soft spicules, seeds oblong-navicular, 6 mm long, brown, coarsely rugose, with a very long silky white coma. June-September (Plate XXXVI, Figure 3).

Riverbanks and wastelands; naturalized.—Caucasus: W. Transc. (Poti, Batumi), Tal. **Gen. distr.:** W. and E. Med., Bal.-As. Min. Described from Ethiopia. Type in London.

Note. A plant of African origin, often cultivated and readily becoming naturalized in the Mediterranean region. Adventive in the Caucasus, where widely distributed in the floodplains of the numerous branches of the Rion, in the vicinity of Poti. Also occurring in Talysh and reported for the irrigation canals of the Fergana Region.

Economic importance. Stems of this plant are rich in fiber. The silky hairs of the seeds are used as filling material.

Genus 1168. **ASCLEPIAS*** L.

L. Sp. pl. (1753) 214.

Calyx deeply 5-parted; calyx segments ovate, small, reflexed; corolla deeply 5-parted; corolla lobes erect at first, becoming spreading and at

* Named for Asclepiades, a renowned physician who lived in Rome some hundred years B.C.

length reflexed; corona borne at the top of gynostegium, the five scales hooded, the hoods ovate or enlarged at apex, adnate at base to gynostegium, the appendage inside the hood flat or subulate and curved toward the stigma; anthers tipped with a small membranous appendage; pollinia flattened, clavate, pendulous; stigma flattened, obtuse; follicles thick, acuminate, covered with bristles. Seeds comose. Perennial herbs with opposite, verticillate, or rarely alternate leaves and interpetiolar [extra-axillary] umbels.

About 80 species of this genus are distributed in America (Chiefly N.) and Africa. Only one species widely cultivated in S. Europe and in the USSR, where also naturalized.

1. **A. syriaca** L. Sp. pl. (1753) 214, excl. syn. *Apocynum syriacum* Clus. — *A. Cornuti* Dcne in DC. Prodr. VIII (1844) 564; Grossg. Opred. rast. Kavk. 278; Voznach. rosl. URSS, 344.

Perennial; stems herbaceous, simple, stout, covered with scattered short crisp hairs, a broad stripe densely beset with such hairs running down the entire length of stem, the upper internodes whitish from a dense coat of hairs; leaves oblong-elliptic, 13-20 cm long, 7-9.5 cm broad, short-acuminate, rounded or subcordate at base, with a thick midrib, densely white-tomentose beneath, with scattered hairs above, short-petioled; umbels many-flowered; peduncles 4-8 cm long, hairy, inserted between the petioles and chiefly on the upper part of stem; pedicels $2\frac{1}{2}$ times the length of flower, pubescent; flowers large, red; calyx segments reflexed, ovate, 3-4 mm long, long-acuminate, pubescent; corolla parted nearly to base; corolla lobes oval, 6-7 mm long, slightly narrowed at apex, obtuse, covered on the outside with crisp white hairs; corona borne at the top of gynostegium; scales of corona five, with two teeth at each inner angle and a flat horn-shaped appendage from the inner surface of the hood; anthers enlarged at base, with a very broad connective and tipped with a small ovate membranous appendage; pollinia clavate, flattened, 1.25 cm long, 4-5 times the length of the gland; gland oval, somewhat narrowed at the top, the translator arm attached slightly below its middle; stigma 5-angled, flattened, with slits for reception of pollinia deposited by insects; follicles thick, ellipsoid, 6-10 cm long, 1.5-2.5 cm broad, slightly tapering at both ends, whitish from dense short tomentum and bristly-echinate; seeds ovoid, 0.9-1 cm long, markedly flattened, brown, with a broad wrinkled margin and with darker elongated ridged tubercles on both sides. — June-September (Plate XXXVI, Figure 4).

A cultivated North American plant, naturalized in the USSR in the forest-steppe areas of the Ukraine and the Caucasus. Described from North America. Type in London.

Economic importance. The plant has a variety of applications. The seeds contain 19-21% of semidrying oil, used for the production of liquid soap, indispensable in the textile industry where it is employed for preparation of solid fats by hydrogenation, etc. The residual oil cake obtained from oil extraction has considerable food value (it contains up to 47% of crude protein). The roots of *A. curassavica* L. yield asclepin, a substitute for ipecacuanhin. Milkweed is an excellent honey-plant.

Calyx 5-parted; corolla rotate, deeply 5-parted; vernation contorted; corolla lobes spreading, glabrous; scales of corona five, fleshy, equaling the gynostegium, simple; anthers tipped with a membranous appendage; pollinia pendulous; stigma flattened, 5-rayed, dark-umbonate; follicles oblong-acuminate or elongate-obovaloid obtuse; seeds comose. Perennial herbs with a slender erect glabrous stem and opposite linear leaves; inflorescences irregularly corymbose, axillary on the upper part of stem.

A monotypic Sino-Japanese species.

1. **P. paniculata** (Bge.) K. Schum. in Engl. — Pr. Pflanzenf. IV, 2 (1895) 243. — *P. chinense* Bge. apud Decne. in DC. Prodr. VIII (1844) 512; Maxim. Prim. Fl. amur. 196, 474; in Mel. Biol. IX, 775; Gerder in Tr. Bot. Sada, I, 426; Korzh. in Tr. Bot. Sada, XII, 369; Forbes a. Hemsl. Fl. of China, 102; Franch. et Sav. Enum. Pl. Jap. I, 316; Kom. Fl. Man'chzh. III, 281; Kom. and Alis. Opred. rast. Dal'nevost. kr. II, 870. — *Asclepias paniculata* Bge. Enum. pl. Chinae bor. (1831) 43. — Ic.: Kom. and Alis. l.c. — Exs.: GRF, No. 2361.

Perennial; rootstock short, oblique, uniformly covered with slender stringy brown roots; stem 60-80 cm long, erect, slender, terete, simple or few-branched, glabrous; branches strict; leaves linear-lanceolate, 7-11 cm long, 0.6-1 cm broad, acute, revolute, with prominent midrib, glabrous, hispid-margined, short-petioled to sessile; inflorescence subcorymbose racemes borne on slender glabrous peduncles inserted between the petioles and at the ends of branches; bracts minute, lanceolate, brownish-green, ciliate at base; flowers greenish- or brownish-yellow; calyx segments lanceolate, acute, glabrous; corolla lobes oblong, reflexed; scales of corona fleshy, crescent-shaped, attached by concave side to anthers and staminal tube, in open flowers spreading, the staminal tube very short; anthers large, dilated toward base, tipped with a very small rhomboid acute membranous appendage; pollinia fusiform, slightly longer 672 than the ovate acute gland; translator arms very short, enlarged at the point of attachment to pollinia; stigma flattened, 5-angled; follicles ovoid, long-acuminate, 6.5-7.5 cm long, glabrous; seeds 0.6-0.7 cm long, ovoid, narrow-winged. Fl. May-July; fr. July-September (Plate XXXVI, Figure 1).

Sandy ridges in floodplains and dry stony or rocky slopes. — E. Siberia: Dau.; Far East: Ze.-Bu., Uss. **Gen. distr.:** Manchuria, Korea, N. China, Japan. Described from N. China. Type in Paris.

Tribe 3. **CYNANCHINAE** K. Schum. in Engl. — Pr. Pflanzenf. IV, 2 (1895) 245. — Corona adherent to gynostegium, the scales connate high up; estivation contorted.

* From Greek *pycnos* = densely, and *stelein* = to set up (furnished, vested).

Genus 1170. **METAPLEXIS*** BGE.

R. Br. in Mem. Wern. Soc. I (1809) 48.—*Urostelma* Bge. Enum. pl. Chinae bor. (1831) 44.

Calyx 5-parted; corolla subrotate, 5-parted, the arched-recurved lobes bearded within; corona short, the concave fleshy scales alternate with anthers; anthers much longer than filaments, tipped with a cordate-ovate acute membranous appendage; pollinia ovaloid, large; attached to gland by short translator arms; ovary one; stigma conical, filiformly acuminate, flexuous, 2-lobed at the top; follicles single, thick, lanceolate, acute, covered with scattered short hairs. Shrubs with twining stems and opposite cordate leaves; inflorescences racemose, many-flowered, the peduncles inserted between the leaf petioles [extra-axillary].

An insufficiently studied genus, almost monotypic, distributed in Japan and China, another species being reported for South America (Venezuela).

1. **M. japonica** (Thunb.) Makino in Tokyo Bot. Mag. XVII (1903) 87.—*M. Stauntoni* Roem. et Schult. Syst. veg. VI (1820) 111; Maxim. Prim. Fl. amur. 196; Franch. et Sav. Enum. pl. Jap. I, 316; Schum. in Engl.—Pr. Pflanzenf. IV, 2, 248; Kom. and Alis. Oprod. rast. Dal'nevost. kr. II, 870.—*M. chinensis* Dcne. in DC. Prodr. VIII (1844) 511; Turcz. in Bull. Soc. Nat. Mosc. VII (1837) 150.—*M. rostellata* Turcz. in Bull. Soc. Nat. Mosc. XXI, 1 (1848) 53; Maxim. l.c. 196; Mel. biol. IX, 810; Schum. l.c.; Palib. Consp. Fl. Kor. II, 13.—*Urostelma chinensis* Bge. Enum. pl. Chinae bor. (1831) 44.—*Pergularia japonica* Thunb. Fl. Jap. (1784) 111.—Ic.: Somoku-Dzusetsu, ed. 2 (1874) tab. 36.

Shrubs; stems twining, very long, branched, terete, smooth; leaves cordate-ovate, 8-13 cm long, 4-9 cm broad, mucronate, dark green, paler on the underside, pinnately nerved, glabrous or sparsely puberulous on the veins, sometimes pubescent throughout; petioles slender, 2-4 cm long, smooth; inflorescence racemose, 8-16-flowered, the pubescent peduncles shorter than leaves; bracts very small, narrow, ciliate; pedicels the length of flowers, pubescent; flowers large, pink, white, or white below and in middle part lilac; calyx segments narrowly lanceolate, 5 mm long, ciliate or pubescent; corolla campanulate, short-tubed; corolla lobes narrow, 7-8 mm long, bearded within, round-tipped; corona very short, the rounded fleshy scales 0.5 mm long; gynostegium also very short; anthers 1.5 mm long, the membranous appendage at the tip ovate, acute, large, 1 mm long, irregularly toothed-margined; pollinia ovaloid, thick, short, equaling the thick gland; translator arms very short, enlarged near the pollinia, the point attached in upper one-third; stigma conical, filiformly attenuated, to 6 mm long, bilobed at the top, the angles of the enlarged part of stigma with a minute globose appendage at the end of scaphoid thickenings; follicles 5-7 cm long, lanceolate, thick, acuminate and recurved at the end, covered with scattered short hairs; seeds brown, flattened, ovoid, 7-8 mm long, broadly winged, the lower margin coarsely and irregularly toothed. Fl. second half of May-July; fr. August-September (Plate XXXVI, Figure 2).

Sandy and pebbly riverbanks and scrub thickets on mountain slopes.—Far East: Ze.-Bu., Uss. **Gen. distr.:** Manchuria, Korea, China, Japan. Described from Japan. Type in Berlin.

* From Greek *meta* = between, and *plecein* = to plait, referring to insertion of peduncles between petioles or to alternation of corona scales and anthers.

Note. The plant is variable in its characters and displays differences due to age which were sometimes interpreted as specific differences. Thus, *M. rostellata* was described by Turchaninova, apparently without justification, as the characters distinguishing it from *M. japonica* (pubescence of veins, smaller size of leaves and flowers) concern differences attributable to age. Moreover, *M. rostellata* does not have any distinct distribution area and occurs in the area occupied by *M. japonica*.

Worthy of note are the differences in seeds characters in Japanese plants of this species (with whitish elongated tubercles) and Ussuri plants (not tubercled, with smaller teeth on the margin). It is, however, difficult to assess the consistency of these characters with the limited material available.

674

Genus 1171. **ANTITOXICUM*** POBED.

Pobed, in Bot. Mat. Gerb. Bot. inst. AN SSSR, XV (1952). — *Vincetoxicum* Moench, Meth. (1794) 717, non Walt.

Flowers 5-merous; calyx 5-parted; corolla rotate, deeply 5-parted; appendages at the base of anthers fused into a cup-shaped or salverform corona; scales of corona five, rounded-triangular acute or slightly acuminate, fleshy, often alternating with five minute teeth; anthers with dilated connective, tipped with a scarious appendage, the anther cells turned inward and firmly attached to stigma; pollinia ovaloid, coherent in pairs, the translator arms attached to minute hard oval glands (0.25 mm long), the gland pincerlike at base, attached at each of the five angles of the stigma in such a way that the two adherent pollinia are seated in cells of two adjoining stamens, the anthers thus apparently fused at the top and separating only upon removal of the entire pollination apparatus; ovaries two, distinct, the short styles united; stigma thick, 5-angled; fruit a follicle; seeds with a coma of long hairs. Perennial herbs or subshrubs (not in the USSR), with erect or twining stems and opposite leaves; inflorescence a simple or compound umbel or corymb; flowers small.

Note. The controversy in the recent Russian literature, regarding the relationship of *Vincetoxicum* and *Cynanchum*, has been settled in favor of independent standing for the two allied genera. They are approved as distinct species by B. K. Shishkin in "Flora Zapadnoi Sibiri" ["Flora of Western Siberia"] and by Barbarich in "Viznachnike rosl. URSR" ["Key to Plants of the Ukrainian RSR" — in the Ukrainian language]. Some fifty years ago, N. I. Kuznetsov, in his monographic treatment of these genera for the Caucasus and the Crimea, preferred unification of these genera on the ground that in the tropics, in the development center of the family, there are species which share characteristics of both genera. This argument is, however, unconvincing.

The difficulties involved in identification of species of *Antitoxicum*, beside the frequent hybridization, are due to the small size of the flowers and the fact that the very complicated flower composition serves as an identifying character for the genus *Antitoxicum* (e.g., the structure of the pollination apparatus that hardly attains 0.5 mm in length, or the

* From Greek *anti* = against, and *toxicon* = poison, in allusion to the antitoxic properties of the plants.

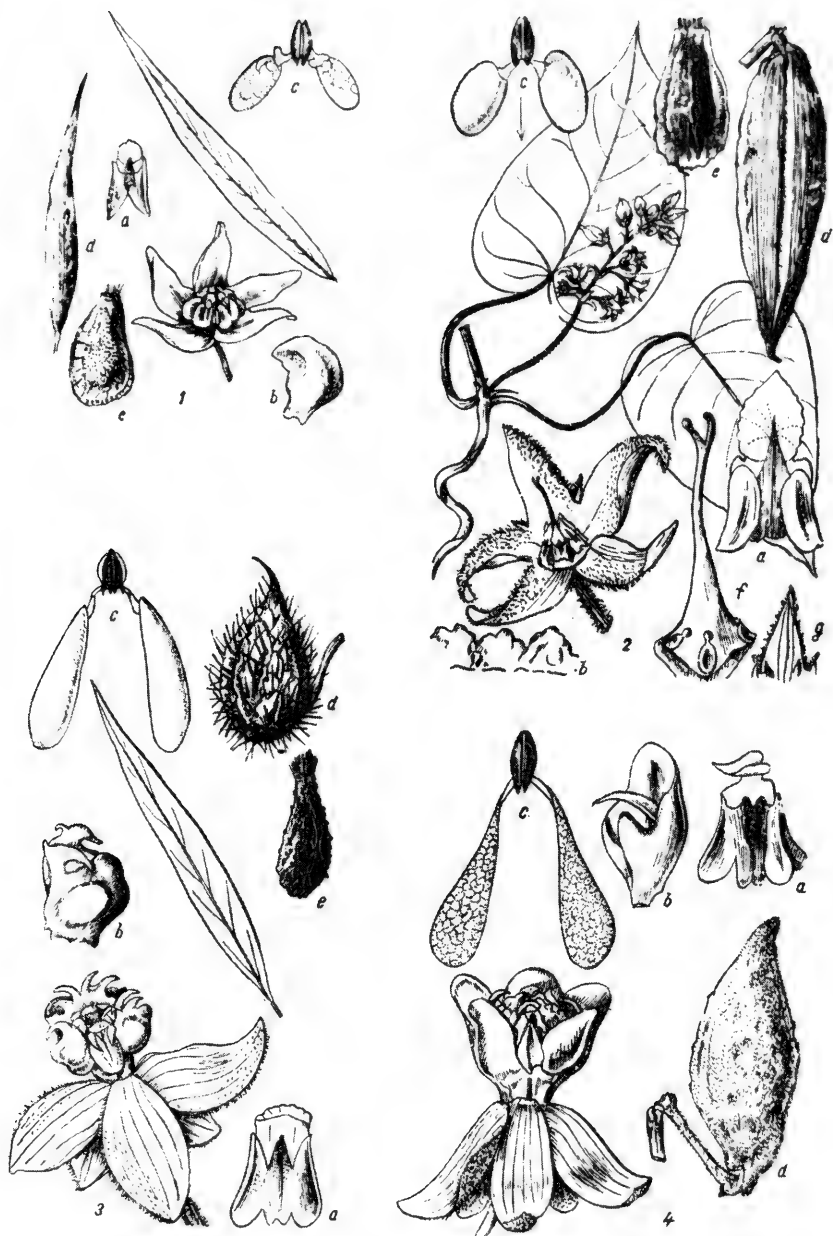


Plate XXXVI

1. *Pycnostelma paniculata* (Bge.) K. Schum.—2. *Metaplexis japonica* (Thunb.) Makino.—
 3. *Gomphocarpus fruticosus* (L.) R. Br.—4. *Asclepias syriaca* L.—Annotations of details:
 a) anther, b) scales of corona, c) pollinia and gland, d) follicle, e) seed, f) stigma, g) sepal.

shape of the membranous appendage of the anther about 0.25 mm long). Difficulties involved in identification of species are similarly due to the considerable polymorphism of vegetative parts even in the absence of hybridization.

We have therefore attempted as detailed a study as possible of the flower structure of the native species, taking into consideration their characteristics in the description, chiefly on the basis of material available in the herbarium of the Botanical Institute of the Academy of Science of the USSR. All the same, we are far from claiming that the genus has received a comprehensive critical treatment. We consider that additional material is undoubtedly needed for the Crimea and the Caucasus, where the greatest variability of *Antitoxicum* occurs, for determination of some of the races which we marked as distinctive. Supplementary field studies of species are also needed.

1. Flowers blackish-purple, dark red, red, light reddish or brown. 2.
- + Flowers white, yellowish-white or yellowish-green 12.
2. Corolla covered within or outside with white hairs 3.
- + Corolla glabrous within and outside 6.
3. Corolla hairy outside, glabrous within; plants velutinous throughout; flowers large, 20-22 mm in diameter (Far East) 23. *A. atratum* (Bge.) Pobed.
- + Corolla glabrous outside, hairy within; stems, peduncles, the margins and veins of leaves and petioles covered with short crisped hairs ... 4.
4. Stem twining at the end; inflorescences loose, borne on rather long peduncles; flowers blackish-purple 1. *A. scandens* (Somm. et Lev.) Pobed.
- + Stem erect, not twining; inflorescences congested and nearly sessile umbels; flowers dingy brown 5.
5. Plants 15-40 cm tall; leaves ovate to suborbicular, abruptly short-attenuate at apex; calyx segments ciliate (Turkmenistan) 11. *A. pumilum* (Dcne.) Pobed.
- + Plants 30-60 cm tall; leaves triangular-ovate, gradually attenuated at apex; calyx lobes pubescent (Pam.-Al.) 12. *A. darvasicum* (B. Fedtsch.) Pobed.
6. Flowers dark red or nearly black 7.
- + Flowers brown or light reddish. 9.
7. Umbels crowded or capitate; pedicels short; corona without teeth between the five scales 10. *A. funebre* (Boiss. et Ky.) Pobed.
- + Umbels loose; pedicels twice the length of flower; corolla with five teeth separating the five scales. 8.
- 678 8. Stem 35-80 cm long; corona cleft to one-third, the teeth between scales more or less pronounced; leaves upright in fruiting 4. *A. Schmalhauseni* (Kusn.) Pobed.
- + Stem 14-20 cm long; corona with poorly developed scales, the intermediate teeth nearly as long as the scales; leaves drooping in fruit. 7. *A. intermedium* (Taliev) Pobed.
9. Leaves ovate or elliptic, 6-8 cm long, 3-4 cm broad 10.
- + Leaves smaller and broader, 2-6 cm long, 2-3.5 cm broad 11.
10. Stems slightly twining at the end, 35-80 cm long, with hairs in two ranks; flowers light reddish 9. *A. rossicum* (Kleop.) Pobed.
- + Stems erect, 20-60 cm long, densely and evenly covered with crisped hairs; flowers brown 8. *A. mugodsharicum* Pobed.

11. Flowers 10 mm in diameter; plants 20-40 cm tall; leaves 4.5-6 cm long, 3-3.5 cm broad 5. **A. maeoticum** (Kleop.) Pobed.
- + Flowers 5-6 mm in diameter; plants 20-25 cm tall; leaves small, (2) 3 (4) cm long, 2-3 cm broad 6. **A. minus** (C. Koch) Pobed.
12. Corolla hairy within 13.
- + Corolla glabrous within 21.
13. Stem twining throughout or merely at the end 14.
- + Stem erect, not twining, often branched at the end 16.
14. Stem twining throughout; leaves lanceolate, long-acuminate; flowers 12-18 mm in diameter; corolla lobes linear-lanceolate to lanceolate (Far East). 22. **A. volubile** (Maxim.) Pobed.
- + Stem twining merely at the end, rarely throughout; leaves ovate or elliptic; flowers 4-7 mm in diameter. 15.
15. A sturdy plant, with stems up to 2 m long; leaves 11-13 cm long, 4.5-6 cm broad; corona deeply 5-cleft (Caucasus) 2. **A. Rehmannii** (Boiss.) Pobed.
- + Plants weaker, 40-60 cm tall; leaves 5-10 cm long, 3-4 cm broad; corolla weakly 5-parted, mostly with five teeth between the scales. 3. **A. Juzepczukii** Pobed.
16. Leaves sessile, amplexicaul; flowers 10-12 mm in diameter (Far East) 24. **A. amplexicaule** (Sieb. et Zucc.) Pobed.
- + Leaves petiolate; flowers 4-6 mm in diameter 17.
17. Umbels 5 or 6 on one long branched peduncle; leaves coriaceous, broadly ovate, short-acuminate 14. **A. stauropolitanum** Pobed.
- 679 + Umbels 1, 2 or 3 on one short peduncle or inflorescences subsessile. 18.
18. Stems sometimes branched chiefly at the end; leaves coriaceous; corona with five scales, without intermediate teeth 19.
- + Stems always unbranched; leaves rather thick but not coriaceous; corona with five scales and five intermediate teeth (Crimea) 17. **A. jaiilicola** (Juz.) Pobed.
19. Leaves suborbicular, 3-6 cm long and broad; scales of corona triangular, deeply cleft; follicles broad, inflated at base 13. **A. Albovianum** (Kusn.) Pobed.
- + Leaves ovate, more or less attenuate toward apex, 5.5-8 cm long, 1-5 cm broad. 20.
20. Calyx segments hairy; corona deeply cleft, with triangular-ovate scales; follicles covered with short scattered hairs 15. **A. Raddeanum** (Alb.) Pobed.
- + Calyx segments glabrous; corona shallowly cleft, the lobes rounded; follicles glabrous 16. **A. tauricum** Pobed.
21. Leaves linear to linear-lanceolate, 4-7 cm long, 0.3-0.45 cm broad; stems numerous, often branched from base. 27. **A. sibiricum** (L.) Pobed.
- + Leaves lanceolate, ovate or oval; stems simple or slightly branched. 22.
22. Flowers large, 15-18 mm in diameter (Far East) 25. **A. acuminatum** (Dcne.) Pobed.
- + Flowers smaller, 6-10 mm in diameter 23.
23. Stems twining at the end; leaves ovate-lanceolate, the lower ovate, the upper lanceolate, thin; corona shallowly (to one-third) cleft, often with an incomplete number of intermediate teeth 18. **A. officinale** (L.) Pobed.

- + Stem erect, not twining except at times slightly at the end. 24.
- 24. Umbels subsessile, 3-5-flowered, singly in the axils of uppermost leaves; corona divergent from gynostegium; pollinia about half the length of gland (Far East) 26. **A. inamoenum** (Maxim.) Pobed.
- + Umbels borne on peduncles shorter or longer than leaves, in the axils of upper and middle leaves; corona appressed to gynostegium; pollinia as long as or slightly shorter than the gland 25.
- 25. Leaves ovate, rather long-attenuated and pointed at apex, thickish, firm to subcoriaceous; peduncles commonly shorter than leaves; flowers pale yellow. 19. **A. laxum** (Bartl.) Pobed.
- 680 + Leaves ovate, not attenuate at apex or slightly so, thin; flowers white. 26.
- 26. Stems 20-30 cm long, branched throughout; leaves ovate, acute, not attenuate at apex, 2-3 (4) cm long, 0.8-1.8 (2) cm broad; peduncles shorter than leaves; umbels few-flowered (2-4-6 flowers). 21. **A. cretaceum** Pobed.
- + Stems 30-70 cm long, simple, unbranched; leaves 3.5-8 cm long, 2.5-4 cm broad, more or less attenuate at apex; peduncles mostly exceeding the leaves; umbels many-flowered (5-10 flowers) 20. **A. stepposum** Pobed.

Section 1. **EUANTITOXICUM** Pobed. in Addenda XVII, 752. — Scales of corona fleshy, rounded or triangular; membranous appendage of anther round or reniform, not exceeding the anther.

Series 1. **Nigrae** Pobed. — Corolla hairy within, blackish-purple or yellowish-green; corona with five scales, without intermediate teeth; inflorescences loose, long-peduncled; leaves thin; stems twining. Of the W. European species, this series contains *A. nigrum* (Moench) Pobed. and *A. Huteri* (Vas. et Aschers.) Pobed.

Note. N.I. Kuznetsov (in Mat. Fl. Kavk.) sets up as a distinct species, *Cynanchum Boissieri* Kusn. (= *Antitoxicum Boissieri* (Kusn.) Pobed.), a plant growing in E. Anatolia and in respect of morphological characters apparently occupying an intermediate position between the series *Nigrae* and *Mediae*. As regards general appearance and the 5-scaled corona with short teeth, it approached the group of low-growing species of the series *Mediae*, such as *V. intermedium*, *V. minus*, and *V. mugodsharicum*. On the other hand, the pubescence of the inner surface of corolla places this plant close to the W. European species *A. nigrum* (of the series *Nigrae*). The plant differs from *A. nigrum* in the short erect (not twining) stems. The species has not so far been found in the Caucasus.

1. **A. scandens** (Somm. et Lév.) Pobed. comb. n. — *Vincetoxicum scandens* Somm. et Lév. in Tr. Bot. Sada, XII (1892) 158; Somm. et Lév. Enum. in Tr. Bot. Sada, XVI (1900) 337; Shirayev, Zametka o Vincetox. [Note on Vincetoxicum] 10. — *V. amplifolium* C. Koch in Linnaea, XXIII (1850) 592, nom. conf. — *V. triste* C. Koch, l.c. non Gris.; Shmal'g. Fl. II, 209. — *V. nigrum* Ldb. Fl. Ross. III, (1847) 45; Boiss. Fl. or. IV, 53; Lomak. Fl. Talysh. 61; Shmal'g., l.c. (quoad

descript.).— *Asclepias nigra* M.B. Fl. taur.-cauc. I (1808) 171; III (1819) 173, non L.— *Cynanchum nigrum* C.A.M. Verz. d. Pfl. (1831) 117; Eichw. Reise casp.-cauc. 22; Hohen. Enum. Tal. 88.— *C. scandens* Kusn. in Mat. Fl. Kavk. IV, 1 (1905) 446; Grossg. Fl. Kavk. III, 236.— Ic.: Somm. et Lév. l.c. XVI (1900), tab. XXXIV.

681 Perennial; roots numerous, stringy, long, brown, arising from the crown; stems up to 2 m long, erect, at the end or from the middle strongly twining, the upper internodes much elongated, the lowest glabrous, the others covered uniseriably or scatteredly all round with short hairs; profusely but not densely leafy; leaves ovate or (chiefly the lower ones) lanceolate, rounded or subcordate at base, acute, the upper ones narrow, more or less attenuate toward apex, 9-14 (16) cm long, 5-6 (9) cm broad, glabrous, slightly hairy on the margins and on the veins on both sides, thin, paler beneath, the petioles 1-1.5 cm long, hairy; umbels 2 or 3 on long slender flexuous geniculate hairy axillary peduncles, 6-10-flowered; flowers small, 4-6 mm in diameter or larger and up to 8 mm in diameter, blackish-purple, densely white-pubescent within; pedicels slender, 2-3 times the length of flower, covered with crisped hairs; scales of corona five, rounded, inflated, deeply cleft, dark red; membranous appendage of anther broad, reniform, inflexed; pollinia clavate; glands the size of pollinia, narrow; translator arms upturned; follicles narrow, 7-8 cm long and 0.8-0.9 cm broad, long-acuminate toward apex (short-acuminate in Crimean specimens), glabrous; seeds ovoid, strongly compressed, brown, rather broadly winged, the surface under strong magnification alveolate. Fl. May-August; fr. July-November.

Mountain forests, exposed mountain slopes, and coastal hills.— European part: L. V., L. Don, Bl., Crim.; Caucasus: all regions. **Gen. distr.:** Asia Minor. Described from the Batumi area. Type in Florence; cotype in Leningrad.

Note. An earlier name was given to this species by Koch in 1850 — *V. amplifolium*; Koch, however, failed to indicate such important characters as the composition of the corona and flower color, and thus Boissier (in Fl. orient.) included the species described by Koch among the synonyms of *V. nigrum* Moench. In 1892, Sommier and Lévier published again the same species under the name *V. scandens*, supplying a detailed description. This name was also adopted by N.I. Kuznetsov (l.c.) on the ground that the very inadequate description made it difficult to determine which species Koch had actually had in mind in describing *V. amplifolium*. Kuznetsov maintains that the samples sent to Koch from Georgia by Wilhelmsohn did not belong to the dark purple-flowered *V. scandens*, but to *V. Rehmanni*, a species with yellowish-greenish corolla which in other characters closely resembles *V. scandens*. This argument of Kuznetsov is hardly convincing, since Boissier, who considered *V. amplifolium* as a synonym of *V. nigrum*, with blackish-purple flowers, described (in the same work) *V. Rehmanni* with yellowish-greenish flowers. Apparently Koch's specimen belonged among samples 682 with blackish-purple flowers, i.e., was identical with *V. scandens*. Since, however, we do not have Koch's type and our conclusion concerning the identity of the species *V. amplifolium* and *V. scandens* is based solely on reasoning, we retain the already firmly established appellation *V. scandens*. The type has large flowers, but nearly half of all available specimens is characterized by very small flowers; both forms occur in the Caucasus as well as in the Crimea.

2. **A. Rehmanni** (Boiss.) Pobed. comb. n. — *Vincetoxicum* Rehmanni Boiss. Fl. or. IV (1879) 53; Trautv. Incr. 15; Lipsk. Fl. Kavk. 389. — *V. medium* Stev. Verz. taur. Pfl. (1856) 331, non Dcne. — *V. officinale* Grinevezk. Rezul't. dvukh puteshestv. na Kavk. (1903) 45, non Moench. — *V. nigrum* var. *volubile* Radde, Grundz. in Engl. u. Drude, Veget. d. Erde (1899) 163. — *Cynanchum Rehmanni* Kusn. in Mat. Fl. Kavk. IV, 1 (1905) 445; Grossg. Fl. Kavk. III, 237.

Perennial; roots stringy, slender, long, arising in a tuft at the crown; stems 1-2 m long, very slender in distal part, twining; simple or few-branched, the upper internodes elongated, vested uniserially or biserially with short crisped hairs; branches slender, coiled at tips; leaves ovate or elliptic, 11-13 cm long, 4.5-6 cm broad, the upper lanceolate, 2-5 cm long and 1-1.5 cm broad, rounded to subcordate at base, rather long-acuminate, pubescent on the margin on the veins on both sides and on petiole; petiole 1-1.5 cm long; umbels 2 or rarely 3 per peduncle, few-flowered; peduncles 1-5 cm long, flexuous, geniculate, slender, axillary, often exceeding the small upper leaves; pedicels slender, about twice the length of flower, pubescent; flowers 6-7 mm in diameter, yellowish-greenish, pubescent within; calyx segments 1-1.2 mm long, triangular, pubescent; corolla lobes oblong, obtuse, 3 times the length of calyx, 3-3.5 mm long; corona 5-parted to 1/3; scales of corona 5, fleshy, inflated, rounded-elongate, about equaling the gynostegium; membranous appendage of anthers small, narrower than anther, rounded, inflexed; pollinia yellow, clavate; translator arm slender, upturned; retinaculum narrow, oblong, about equaling the pollinia; follicles lanceolate, narrow, 5-7 cm long and 0.5-0.7 cm broad, markedly attenuate toward the tip, glabrous; seeds ovoid, strongly compressed, brown, alveolate (under strong magnification), narrowly margined. Fl. May-July; fr. July-August (Plate XXXVII, Figure 2).

Scrub; hornbeam-hazelnut and hazelnut woods. — Caucasus: all regions except Tal. Endemic. Described from Vladikavkaz (Dzardzhikau). Type in Geneva.

683 Note. A very variable species, in need of critical revision based on ample material and field study. Samples from Dagestan and Kuibinskii area (Orta-kala) draw attention by their coriaceous ovate and little attenuated leaves and greater number of umbels per peduncle. Of interest are also samples from Shemakha, Nukha, and the Tbilisi vicinity, with stems strongly twining throughout, lanceolate coriaceous leaves, corolla lobes pubescent within only in upper half, and corona more deeply cleft than in *A. Rehmanni*. The characteristics mentioned also occur to some extent in *A. Rehmanni* and they are not sufficiently confirmed; they therefore need confirmation with supplementary material.

3. **A. Juzepczukii** Pobed. sp. n. in Addenda XVIII, 752.

Perennial; 40-60 cm tall, with a small tuft of light brown stringy roots arising from crown; stems slender, twining at the tip or in upper part, biserially vested in broad stripes with short crisp hairs and pubescent in a circle about the nodes; leaves elliptic or ovate, 5-10 cm long, 3-4 cm broad, gradually long-attenuate at apex, cordate at base, paler underneath, the veins margin, and especially the petiole, densely pubescent; petioles 3-6 mm long; umbels in pairs, 3-5-flowered; peduncles 1-2 cm long,

straight, axillary; pedicels pubescent, twice the length of flower, subtended by minute linear to linear-lanceolate ciliate bracteoles; flowers yellowish-greenish, 4-5 mm in diameter; calyx segments lanceolate, 1-2 mm long, sparsely pubescent to glabrate; corolla lobes oblong, 2-3 mm long, obtuse, involute [not revolute as in Appendix], covered within with scattered short white hairs or sometimes glabrate; scales of corona 5, short, obtuse, nearly rounded, alternating with 5 or sometimes fewer teeth; membranous appendage of anthers broad, nearly round; pollinia oblong, as long as the narrow oblong glands; translator arms narrow, upturned; immature follicles 4.5-5 cm long and 0.5-0.7 cm broad, fusiform, glabrous; seeds unknown. Fl. May-July; fr. July and later.

Beech woods in Crimean Mountains. — European part: Crim. Described from Mt. Chatyr Dag. Type in Leningrad.

684 **Note.** This species is identified in herbaria as *Vincetoxicum officinale* or *V. laxum*, but it differs markedly from both these species. It should suffice to point out the slight pubescence within the flower, a characteristic not associated with either species. *A. Juzepczukii* is much more closely related to two other species, belonging to the same genetical series, namely *A. Rehmanni* (Boiss.) Pobed. and *A. Huteri* (Vas. et Aschers.) Pobed. (Dalmatia). As regards general aspect, the narrower leaves, the smaller plant size, and the corona with 5 intermediate teeth, it comes close to *A. Huteri*; it differs from this species only in the distinctly developed though shallow scales of corona (in *A. Huteri* the corona is united practically to the top, the scales being reduced to a wavy line) and the oblong pollinia (as opposed to the clavate, apically strongly narrowed, pollinia of *A. Huteri*). The characters distinguishing the new species from *A. Rehmanni* are even more pronounced: *A. Juzepczukii* is a less vigorous plant, with a shorter stem and smaller leaves; its corona has intermediate teeth and corolla lobes are slightly pubescent within. The three species represent three closely related, geographically defined races, associated with three different regions: the Caucasus, the Crimea, and the Balkan Peninsula.

Series 2. Mediae Pobed. — Corolla glabrous within, dark red, red, light reddish or brown; corolla with 5 scales and 5 intermediate teeth; inflorescences short-peduncled to subsessile; stems straight, rarely slightly twining at the tip. The West European representative of this series is *A. medium* (Decne.) Pobed.

4. ***A. Schmalhausonii*** (Kusn.) Pobed. comb. n. — *Vincetoxicum medium* Schmalh. Fl. II (1897) 209, pro max. p. non Decne.; Shiryayev, *Zametka o Vincetox.* [Note on *Vincetoxicum*] 5-6, p.p. quoad Nos. 1, 2 and 5. — *Cynanchum Schmalhausonii* Kusn. in Mat. Fl. Kavk. IV, 1 (1905) 469; Grossg. Fl. Kavk. III, 236.

687 Perennial; stems 35-80 cm long, erect, simple, biserially pubescent; leaves ovate to ovate-lanceolate, 5-7 cm long, 3-4 cm broad, upper elliptic-lanceolate, rounded to subcordate at base, rather long-acuminate at apex; the veins, margins and petiole pubescent; petioles 0.8-1 cm long; umbels rather few-flowered, axillary; peduncles pubescent, mostly equaling or slightly exceeding the leaves; flowers 5-6 mm in diameter, red; calyx segments triangular, acute, pubescent; corolla lobes oblong, 2-2.3 mm long, 1.5-1.8 mm broad, obtusish to round-tipped, glabrous within; corona about equaling the gynostegium, with 5 broad

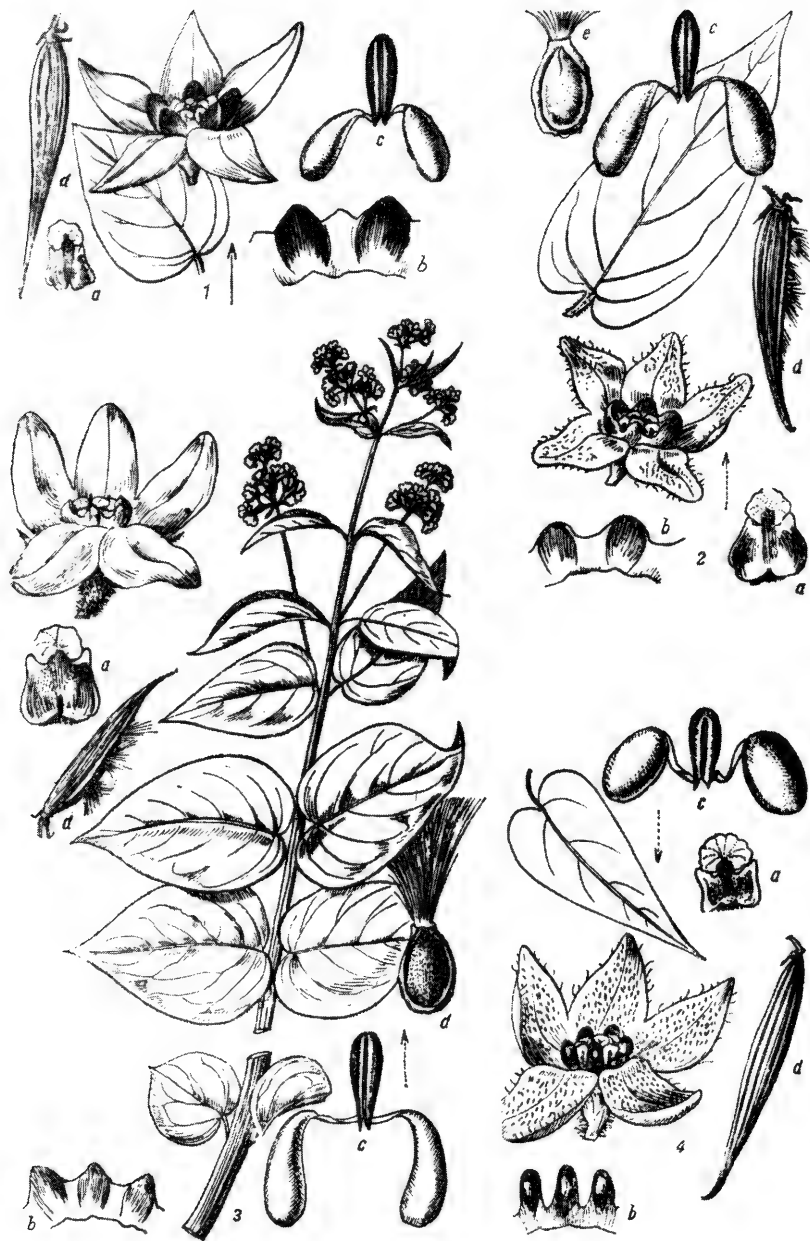


Plate XXXVII

1. *Antitoxicum Schmalhausensei* (Kusn.) Pobed.— 2. *A. Rehmanni* (Boiss.) Pobed.— 3. *A. stepposum* Pobed.— 4. *A. darvasicum* B. Fedtsch.— Annotations of details: a) anther, b) scales of corona, c) pollinia and gland, d) follicles, e) seed.

rounded little-cleft scales and 5 small intermediate membranous teeth; pollinia thick, subovaloid; gland oblong, slightly shorter than pollinia; follicles long-acuminate, glabrous, 5-6 cm long, 0.4-0.5 cm broad. Fl. June-July; fr. August (Plate XXXVII, Figure 1).

Calcareous mountain slopes.— European part: Crimea; Caucasus: Cisc., Dag. Described from Ciscaucasia. Type in Tbilisi.

5. **A. maeoticum** (Kleop.) Pobed.— *Vincetoxicum maeoticum* (Kleop.) Barbar. *Vizn. rosl. URSR* (1950) 395.— *Cynanchum maeoticum* Kleop. in *Izv. Kievsk. Bot. Sada*, IX (1929) 70.— *C. Schmalhauseni* auct. fl. Ucr. non Kusn.

Perennial; 20-40 cm tall; rootstock short, stringy, ligneous, beset with white scarious scales; stems several, erect, simple, the upper internodes short, pubescent nearly all round, the middle densely biserially pubescent, the lower glabrate or with a single stripe of short hairs; leaves herbaceous, ovate, the upper ovate-lanceolate, the lower suborbicular, 4.5-6 cm long, 3-3.5 cm broad; the veins on both sides, the margin and petiole pubescent; petioles 0.5-1 cm long; umbels 2-6-flowered, 1 or 2 per peduncle; peduncles 0.5-1.5 cm long, densely covered with crisp hairs; pedicels densely crisp-hairy, equaling to slightly exceeding the flower; flowers 10 mm in diameter, brown, glabrous within; calyx segments lanceolate, 2-2.5 mm long, ciliate; corolla lobes oblong, narrow, 4-5 mm long, obtusish, the margin white-hyaline; scales of corona round, widely spaced, joined right up by a membrane and 5 small distinct teeth in interstices; membranous appendage of anthers round, narrower than anther; pollinia thick, abruptly narrowed at the top, equaling the narrow gland; follicles and seeds unknown. Fl. April-May.

Rocks, stony or clayey gully slopes, and steppes.— European part: L. Don. Endemic. Described from Mariupol vicinity. Type in Kiev.

Note. This species differs from *A. Schmalhauseni* (Kusn.) Pobed. in the shorter stems (20-40 cm as against 30-80 cm), short peduncles, brownish-pink (not red) flowers, narrower corolla lobes, and shorter corona scales.

6. **A. minus** (C. Koch) Pobed. comb. n.— *Vincetoxicum minus* C. Koch in *Linnaea*, XXIII (1850) 590.— *Cynanchum minus* C. Koch in *Linnaea*, XIX (1847) 27.— *C. Kuznetzowii* E. Bordz. in *Izv. Kievsk. Bot. Sada*, VII-VIII (1928) 20; *Grossg. Fl. Kavk.* III, 236.

688 Perennial, 20-25 cm tall; rootstock short, stout, densely beset with slender stringy light brown roots; stems several from the rootstock, simple or sometimes few-branched, erect, biserially pubescent, densely leafy, the lower internodes glabrous; leaves oval or ovate, the lower suborbicular, the upper ovate-lanceolate to lanceolate, (2) 3 (4) cm long, 2-3 cm broad, scarcely cordate or rounded at base, obtuse or short-acuminate; the margin, the veins on both sides and petiole pubescent; umbels few-flowered, axillary, sessile, sometimes the upper and lower ones single-flowered and then borne on pedicels 2-3 cm long, otherwise the pedicels $1\frac{1}{2}$ -3 times the length of flower, pubescent; flowers brown, 5-6 mm in diameter; calyx segments triangular-lanceolate, acute, glabrous or very slightly pubescent; corolla lobes 2-2.5 mm long, oval-oblong, obtuse, the margin white-hyaline; corona about equaling the gynostegium,

cup-shaped, with 5 broad but very short scales and 5 triangular-ovate sometimes obsolescent reflexed teeth; pollinia yellow, clavate; gland very narrow, exceeding the pollinia; membranous appendage of anthers round; follicles glabrous, 50-64 cm long, 0.6-1.2 mm broad, long-attenuate at apex; seeds brown, large, 7 mm long and 5-6 mm broad, broadly ovoid to ellipsoid, rather broadly margined, the margin finely and irregularly toothed. Fl. May-June; fr. July.

Stony mountain slopes. — European part: Crimea; Caucasus: S. Transc. **Gen. distr.:** Asia Minor (Artvin, Kars, Trebizond). Described from N. Anatolia. Type in Berlin.

Note. We have seen neither the type of this species nor the original specimens from N. Anatolia, identified as *Vincetoxicum minus*, but all the same we identify *V. Kuznetzowii* E. Bordz. with *V. minus*, C. Koch as, in the light of the following considerations, the descriptions do not make it possible to distinguish between them. E. I. Bordzilovskii, in his original description of *V. Kuznetzowii*, notes the glabrous calyx and the structure of corona as characters distinguishing this species from *V. minus* C. Koch. However in Koch's original description of *V. minus* there is no indication whatever concerning the presence or absence of calyx pubescence in his new species. The corona, according to description of both species, has 5 scales, although Bordzilovskii mentions the occurrence of a 10-parted corona, i.e., with 5 subsidiary teeth. It should be pointed out that the teeth in the corona of *V. Kuznetzowii* are so small that they could have been easily overlooked by Koch, and hence his description of *V. minus* does not include this detail. We therefore believe that the differences mentioned are nonexistent. Moreover, the distribution area of *V. Kuznetzowii* is a direct continuation of the distribution area of 689 *V. minus*. The herbarium material which includes collections of *V. Kuznetzowii* from Kars Province and Artvin district, not cited by Bordzilovskii, join the areas of the two species.

N. I. Kuznetsov placed *V. minus* among synonyms of *V. medium*. This procedure is incorrect, considering that *V. minus* differs markedly from *V. medium* in its shorter stems that are always erect and never twining at tips, its brown (not red) flowers, few-flowered inflorescences, and distribution in N. Anatolia and not in the southern part of W. Europe. Yu. D. Kleopov included *V. minus* among the species of the Ukrainian flora. Specimens collected in N. Crimea in the Tarkhankut Peninsula and in Belogorsk, hardly differ in any way from *A. minus*, if one disregards the somewhat narrower drooping leaves.

Boissier (Fl. or. IV, 56) includes *V. minus* among synonyms of his species *V. fuscum*, described from the Balkan Peninsula, and he does not mention N. Anatolia in its location list. Apparently he had not seen Koch's specimens.

7. ***A. intermedium*** (Taliev) Pobed. comb. n. — *Vincetoxicum intermedium* Taliev. in Tr. Obshch. isp. prir. Khar'k. univ. XXXIV (1900) 251; Tr. Bot. sada Yur'evsk. univ. II, 4, 231; Voznachn. rosl. USSR, 395. — *Cynanchum intermedium* Kleop. in Izv. Kievsk. Bot. sada, IX (1929) 70.

Perennial; rootstock short, horizontal, stringy, slender, covered with white scarious scales, and with tufts of slender reddish-brown roots; stems several or solitary, 14-20 cm long, simple, erect, densely and uniformly covered with short hairs; leaves ovate-lanceolate, 3-5 cm long,

1.5-2.5 cm broad, more or less long-attenuate toward apex, rounded to subcordate at base, the lowest ovate, obtusish, the upper lanceolate to linear, long-acuminate, all petiolate, mostly reflexed, the margins and veins on both sides pubescent; petioles pubescent, 0.5-0.8 cm long; umbels axillary, few-flowered, subsessile to short-peduncled, shorter than leaves; pedicels twice the length of flower, pubescent; flowers dark red, 6 mm in diameter; calyx segments narrowly lanceolate, glabrous, half the length of corolla; corolla lobes dark red, oblong, 2.5-3 mm long, obtuse, glabrous within, involute at the tip; corolla with 5 very short but distinct scales and 5 teeth in the interspaces nearly equaling the scales; membranous appendage of anthers semicircular, as broad as the anther; pollinia clavate; gland equaling the pollinia; translator arms short, upturned; follicles lanceolate, 4-4.5 cm long, 0.8-1.5 cm broad, short-acuminate, glabrous; seeds light brown, strongly compressed, with scattered dark red spots on the strongly curved back, the surface (under strong magnification) finely granular on both sides, the margin below with irregular small fine teeth. Fl. May-June; fr. July.

Chalk outcrops and stony soil. — European part: L. Don, Bl. Endemic. Described from Mius and Kryinka rivers. Type in Leningrad.

Note. A species replacing *A. minus* (C. Koch) Pobed. in the Sea of Azov area and differing from it in the dark red (not brown) flowers, narrower leaves, 3-5 cm long and 1.5-2.5 cm broad, as against (2) 3 (4) cm long and 2-3 cm broad, and the more pronounced scales of corona.

8. *A. mugodsharicum* Pobed. comb. n. — *Vincetoxicum mugodsharicum* Pobed. in Bot. Mat. Gerb. Bot. inst. AN SSSR, XIV (1951) 281. — *V. laxum* auct. fl. Asiae Mediae, non Bartl.

Perennial; stem erect, 20-60 cm long, together with leaf petioles densely and regularly covered with short crisp hairs; leaves ovate-lanceolate, 5-8 cm long, 3-4 cm broad, long-acuminate, the upper lanceolate, rounded at base, the lowest orbicular, all petiolate, the margins and the veins on both sides pubescent; petioles 0.5-1 cm long; umbels axillary, 4-6-flowered, subsessile to short-peduncled, shorter than leaves; peduncles and pedicels pubescent; pedicels 2-3 times the length of corolla; flowers 6 mm in diameter, brown (in dry condition); calyx segments narrowly lanceolate, glabrous; corolla lobes oblong, with obtuse inflexed tips; corona cup-shaped, reddish, not exceeding the gynostegium, with 5 weakly pronounced rounded scales alternate with 5 small triangular subsidiary teeth; anthers broad, the membranous appendage broad; pollinia ovaloid, narrowed at the top; gland narrow, equaling the pollinia; stigma 5-angled, slightly convex at the top; follicles lanceolate, narrow, 5.5-6 cm long, 0.6-0.8 cm broad, narrowly long-acuminate, glabrous at apex; seeds brown, subovaloid, broad-margined, the margin finely crenulate. Fl. June; fr. July.

Slopes of chalk mounds, mountain gorges, and bottom of gullies. — Soviet Central Asia: Ar.-Casp. Endemic. Described from Mugodzhary Mountains (Ber-Chogur stanitsa). Type in Leningrad.

9. *A. rossicum* (Kleop.) Pobed. comb. n. — *Vincetoxicum rossicum* (Kleop.) Barbar. in Viznachn. rosl. URSS (1950) 346. — *V. medium* Schmalh. Fl. II (1897) 209, ex parte et auct. non Dcne. — *Cynanchum rossicum* Kleop. in Izv. Kievsk. Bot. Sada, IX (1929) 67.

Perennial; rootstock densely beset with long stringy brown roots; stem 60-120 cm long, simple, slightly twining or flexuous at the tip, biserially pubescent; leaves ovate or elliptic, 6-8 cm long, 3-4 cm broad, long-attenuate at apex, rounded at base, paler underneath, covered on the veins, margins, and petiole with short appressed hairs, the upper ones small, narrower, lanceolate; petiole 0.5-0.7 cm long; umbels (1) 2 (3) on peduncle, 4-6-flowered, axillary; peduncles short, uniserially pubescent; flowers 5-7 cm in diameter, light reddish, glabrous within; calyx glabrous; calyx segments subulate-lanceolate, 1-1.5 mm long, sparsely ciliate-margined; corolla lobes oblong, 3-3.5 mm long, the margin white-hyaline; corona 5-parted to one-third; scales of corona broad, rounded, cleft to one-third, alternately with 5 minute teeth or without teeth; pollinia oblong, scarcely narrowed at apex, golden; gland equaling the pollinia, enlarged toward top; membranous appendage of anther broad, reniform, about as broad as anther; follicles narrow, 4-6 cm long and 0.4-0.5 cm broad, attenuate at the tip, glabrous; seeds 4 mm long, ovaloid, smooth, brown, strongly appressed, narrow-margined, the lower margin crenulate. June.

Slopes of ravines and scrub. — European part: Transv., V.-Don, L. V., Bl. Described from Kharkov Region. Type in Kiev.

Note. *A. rossicum* occupies a unique position among the indigenous species of this series, in having apically twining stems. In this respect it approaches the West European species of the same genetical series, *A. medium* (Decne.) Pobed. in which the tips of stems are also sometimes twining.

Series 3. **Congestiflorae** Pobed. — Corolla pubescent within, dingy brown or glabrous and dark red within, or sometimes nearly black; corona with 5 scales, without intermediate teeth; inflorescences crowded; stems erect.

10. *A. funebre* (Boiss. et Ky.) Pobed. comb. n. — *Vincetoxicum funebre* Boiss. et Ky. in Boiss. Diagn. ser. 1, XI (1849) 79. — *V. medium* Ldb. Fl. Ross. III (1847-1851) 45, non Decne.; Boiss. Fl. or. IV, 55. — *V. medium* var. *latifolium* Trautv. in Tr. Bot. Sada, I, 1 (1871) 33. — *V. latifolium* C. Koch in Linnaea, XXIII (1850) 591. — *Cynanchum funebre* Kuhn. in Mat. Fl. Kavk. IV, 1 (1905) 461; Grossg. Fl. Kavk. III, 236. — *Asclepias nigra* M.B. Fl. taur.-cauc. I (1808) 178, p.p. — Exs.: Pl. or. exs. No. 290; Herb. Fl. Cauc. No. 234; Kotschy, Pl. pers. 1846, No. 359.

Perennial; stems 40-70 cm long, erect, simple or sometimes branched, biserially pubescent, terete; leaves subsessile, rounded-ovate, 3-7 cm long, 3-5 cm broad, subcordate at base, short-acuminate, slightly pubescent on the veins underneath, glabrous and lustrous above; umbels crowded in leaf axils; peduncles shorter than to exceeding the leaves, pubescent; flowers dark red to nearly black, borne on short black pedicels; bracteoles very small, lance-linear, acute, pubescent; calyx glabrous, half the length of corolla; calyx segments triangular-lanceolate, acute; corolla lobes oblong, obtuse, cleft nearly to the middle, glabrous within; corona dark violet, about equaling the gynostegium, with 5 erect triangular-ovate scales; anthers broad, the membranous appendage nearly round slightly emarginate and inflexed; pollinia oblong, equaling the gland;

translator arms short; stigma slightly convex, 5-angled; follicles 4-5 cm long, 0.6-1 cm broad, lanceolate, more or less inflated toward base, attenuate at the tip; seeds brown, strongly compressed, ovoid, covered with scattered long white hairs narrow-margined, the margin smooth. Fl. May-July; fr. July-August.

Dry stony slopes, taluses, and barren places. — Caucasus: Dag., W. (S. part), E. and S. Transc. **Gen. distr.:** N. Iran. Described from N. Iran, from Mt. Demavend. Type in Geneva.

Note. Usually hybridizing with *A. laxum*, *A. scandens*, *A. Rehmanni* and *A. Schmalhauseni*.

Specimens from Dagestan, collected in 1900 by Alekseenko in the Samur area, at Fiiya River gorge, on stony ground, at an altitude of 2000 m, are conspicuous in being much branched and in having relatively small leaves. They were all collected on August 19, at the fruiting stage, and they have no flowers, except for specimen No. 9288 on which a few flowers are retained. An examination of these plants has also disclosed that the corona scales alternating with teeth, are shallow (not deep as in *A. funebre*).

11. *A. pumilum* (Dcne.) Pobed. comb. n. — *Vincetoxicum pumilum* Dcne. in DC. Prodr. VIII (1844) 525; Boiss. Fl. or. IV, 54. — *Cynanchum pumilum* Bornm. in Engl. Bot. Jahrb. LXVI (1934) 234.

Perennial; rootstock many-headed, ligneous, with slender stringy roots; stems several, 15-40 cm long, erect, unbranched, villous; leaves broadly ovate, 3-4 cm long, 2.5-3.5 cm broad, abruptly short-attenuate at apex, subcordate at base, glabrous or sparsely covered with short hairs on the midrib on both sides and on the margin, the petiole very short to obsolescent; umbels axillary, subsessile or peduncles 2-2.5 cm long, pubescent, not exceeding the leaves; pedicels 2-2½ times the length of flower, pubescent; flowers dingy brown, 6-8 mm in diameter; calyx segments triangular, acute, ciliate, 1-1.5 mm long; corolla 2.5-3 mm long, the lobes obtuse, twice the length of sepals, wide-open, white-pubescent within; corona 5-parted nearly to base; scales of corona nearly round, slightly narrowed at base, not exceeding the gynostegium; membranous appendage of anthers nearly round, emarginate and inflexed; pollinia subglobose, subelliptically attenuate; gland scarcely exceeding the pollinia, slightly enlarged upward; translator arms slender, upturned; follicles fusiform, 4.5-5 cm long, 1-1.2 cm broad, slightly attenuate and point-tipped, glabrous; seeds strongly compressed, elongate-ovoid, 5-7 mm long, 2.5-3 mm broad, light brown, smooth-margined, with scattered darker granulation on the back. Fl. April-mid June; fr. June-July.

Mountain gorges, stony slopes and rock crevices. — Soviet Central Asia: Mtn. Turkm. **Gen. distr.:** Iran (N.). Described from N. Iran (Gilan Province). Type in Paris.

Note. This species is often identified as *Vincetoxicum funebre* Boiss. et Ky. which does not in fact penetrate into Soviet Central Asia. *A. pumilum* differs markedly from this species in the corolla which is brown and pubescent within (not black and glabrous), the shorter stems, and the rounded (not triangular) scales of corona.

12. *A. darvasicum* (B. Fedtsch.) Pobed. comb. n. — *Vincetoxicum darvasicum* B. Fedtsch. Perech. rast. Turk. 5 (1913) 15; Fedch. Rast. Turkest. 652.

Perennial; stems numerous from a many-headed ligneous rootstock, erect, unbranched, ascending, 30-60 cm long, covered all round with short crisp hairs; leaves ovate-triangular, 4-5 cm long, 2.5-3 cm broad, gradually attenuate toward apex, rounded at base, pale green, puberulous underneath, the midrib and 2 or 3 lateral veins thick; petiole 5-6 mm long, vested like the stems; umbels axillary, the pubescent peduncles not exceeding the leaves; pedicels equaling the flowers, pubescent; flowers dingy brown, 8 mm in diameter; calyx segments lanceolate, white-pubescent, half the length of corolla; corolla lobes oblong, obtuse, sparsely pubescent within; corona 5-parted nearly to base into rounded-oblong scales, shorter than the gynostegium; membranous appendage of anthers rounded, shallowly emarginate, inflexed but not reaching the stigma; pollinia subglobose, subelliptically elongated; translator arms very slender, 694 upturned; gland very short, equaling the pollinia, slightly enlarged at the top; stigma 5-angled, slightly convex, surpassing the membranous appendage of anthers; follicles linear-oblong, 5.5-6 cm long, long-acuminate, puberulous; seeds brown, strongly compressed, ovoid, smooth, with crenulate margin. Fl. June; fr. July-August (Plate XXXVII, Figure 4).

Stony mountain slopes and rocks. — Soviet Central Asia: Pam.-Al. (Darvaz, Shugnan). Endemic. Described from Darvaz. Type in Leningrad.

Note. A species closely related to the more southerly *A. pumilum* (Dcne.) Pobed. and apparently replacing it in Pamir-Alai.

Series 4. **Albovianae** Pobed. — Corolla pubescent within, yellow or yellowish-greenish; corona with 5 scales, without or very rarely with intermediate teeth; inflorescences dense, many-flowered; leaves coriaceous, petiolate; stems erect. Beside the species occurring in the USSR, this series contains the Iranian species *A. tmoleum* (Boiss.) Pobed. and *A. canescens* (Willd.) Pobed.

13. ***A. Albovianum*** (Kusn.) Pobed. comb.n. — Vincetoxicum probab. sp. n. Alb. Prodr. Fl. Colch. (1895) 170; Lipsk. Fl. Kavk. 389. — *V. officinale* f. *leiocalyx* Somm. et Lév. in Tr. Bot. Sada, XVI (1900) 338. — *Cynanchum Albovianum* Kusn. in Mat. Fl. Kavk. IV, 1 (1905) 445; Grossg. Fl. Kavk. III, 237.

Perennial, branched from crown; stems numerous, simple or branched, stout, glabrous or biserially pubescent; leaves coriaceous, subsessile or borne on short pubescent petiole, covered with scattered hairs on veins and margin, ovate to rounded-ovate, 3-6 cm long and about as broad, short-acuminate, cordate at base; umbels axillary, many-flowered, commonly shorter than leaves, with pubescent peduncles; calyx glabrous, with triangular-lanceolate segments; corolla pale yellow to yellowish-greenish; corolla lobes 3 mm long, 2 mm broad, ovate, obtuse, slightly pubescent within, rarely glabrous or nearly so; corona deeply 5-parted; scales acutely triangular, erect, closely approximate, exceeding the gynostegium; membranous appendage of anthers round; pollinia clavate, narrowed at the top; gland enlarged at the top; follicles lanceolate, 5-7 cm long, long-acuminate, enlarged at base, 1-1.2 cm broad, glabrous; seeds ovoid, 6 mm long and 3 mm broad, light brown, strongly compressed, slightly convex, smooth, with very sparse rather long hairs on the concave surface, the margin narrowly winged. June-July.

Calcareous rocks.—Caucasus: Cisc., W. Transc. Endemic. Described from Abkhazia (Kaldakhvari — around Pitsunda). Type in Tbilisi.

- 695 14. **A. stauropolitanum** Pobed. comb. n.—*Vincetoxicum stauropolitanum* Pobed. in Tr. Bot. Mat. Gerb. Bot. inst. AN SSSR, XIV (1951) 284.

Perennial; stems simple or branched at the end, erect, 50-60 cm long, uni- or biserially pubescent below, very sparsely pubescent elsewhere, slightly more densely at the nodes, the internodes short; leaves coriaceous, the lower broadly ovate, 6-9 cm long, 4.5-6 cm broad, short-acuminate, the middle smaller, ovate, acute, slightly attenuate at apex, 3-4 cm long, 1-1.2 mm broad, lance-ovate, entirely grayish-green, paler underneath, with a prominent network of veins, the veins on both sides and petiole pubescent; petioles 1-1.2 cm long; peduncles axillary, forking, 5-8 cm long, pubescent, bearing 4 or 5 umbels, these 3-5-flowered; pedicels slender, twice the length of flower, pubescent; flowers white (according to collector's note); calyx segments lanceolate, pubescent, one-third the length of corolla; corolla lobes oblong to ovate, 3 mm long, obtuse, with white-hyaline margin, hairs on the inner surface confined to upper half or none; scales of corona 5, acutely triangular (in drying), widely spaced; membranous appendage of anthers broad, reniform; pollinia clavate, golden; gland as long as pollinia, enlarged at the top; follicles glabrous, 3-3.5 cm long and 0.7-0.8 cm broad, acute; seeds brown, narrow-margined, compressed, convex on one side. Fl. June-July; fr. July-August.

Steppe mountain slopes.—Caucasus: Cisc. Endemic. Described from Mt. Brykovaya in Stavropol Territory. Type in Leningrad.

15. **A. Raddeanum** (Alb.) Pobed. comb. n.—*Vincetoxicum Raddeanum* Alb. Prodr. Fl. Colch. (1895) 170; Lipskii, Fl. Kavk. 389.—*V. officinale* Radde in Engl. u. Drude, Veget. d. Erde 3 (1899) 122.—*Cynanchum Raddeanum* Kusn. in Mat. Fl. Kavk. IV, 1 (1905) 442; Grossg. Fl. Kavk. III, 237.

- 696 Perennial; rootstock short, stout, ligneous, with slender stringy light brown roots; stems several, erect, simple or slightly branched, 40-60 cm long, rather densely leafy, covered with short appressed crisp hairs; leaves ovate, the lowest obtuse and suborbicular, the middle short-acuminate, the upper ovate-lanceolate, acute, subcordate or rounded at base, 5.5-7 cm long, 1-4 cm broad, covered on the veins on both sides with short hairs, coriaceous, paler underneath; petioles 3-6 mm long, pubescent; umbels axillary 2-4 per peduncle, rather distant, 2-5-flowered; peduncles long, pubescent; pedicels short, as long as or $1\frac{1}{2}$ -2 times length of flower; flowers 7-8 mm in diameter, yellowish-greenish; calyx segments triangular-lanceolate, 1.5 mm long, pubescent; corolla lobes triangular-lanceolate, 2.5-3 mm long, sparsely pubescent within; corona deeply 5-parted; scales of corona, ovate to triangular-ovate, shorter than gynostegium; membranous appendage rounded, as broad as anther, curved; pollinia ovaloid, thick; gland shorter than pollinia; translator arms short, upturned; stigma thick, fleshy, 5-angled, the angles prominent; follicles 3.5-7 cm long, more or less attenuate at the end, covered with scattered short hairs, slightly inflated at base; seeds ovoid, strongly compressed, 8-9 mm long, brown, very narrow-margined, the surface grainy. Fl. May; fr. June-July.

Rocky sites and taluses. Known from Artvin, and around stanitsa of Solyanye Promysly. Described from Artvin. Type in Tbilisi.

16. **A. tauricum** Pobed. comb. n.—*Vincetoxicum tauricum* Pobed. in Bot. mat. Gerb. Bot. inst. AN SSSR, XIV (1951) 282.—*V. laxum* auct. Fl. taur. non Bartl.—Ic.: Pobed. l.c.

Perennial; 30-70 cm tall; stems erect, simple or branched, especially at upper nodes, biserially pubescent below, the nodes densely covered with short white hairs; leaves coriaceous, pale green, ovate, 5.5-8 cm long, 3.5-5 cm broad, short-acuminate, the upper narrower, lanceolate, small, long, attenuate at apex, the veins on both sides and the margin and petiole pubescent; umbels axillary, 2 or 3 per peduncle, few-flowered; bracteoles narrow, 1-1.5 mm long; bracteoles, peduncles and pedicels densely pubescent; flowers white (?), drying brownish; calyx segments triangular-lanceolate, long-acuminate, glabrous; corolla lobes broadly ovate, 2 mm long and 2.5 mm broad, obtuse, sparsely puberulous within, the margin white-hyaline; corolla rather shallowly 5-parted; scales of corona rounded, widely spaced; membranous appendage of anthers reniform, broader than long; pollinia clavate; gland short, oblong, enlarged at the top; follicles lanceolate, 4-5.5 cm long, 0.4-0.6 cm broad, narrowly long-attenuate, glabrous; seeds subovaloid, slightly narrowed at apex, strongly compressed, brown, rather broad light brown margin, both surfaces rugose. Fl. June-July; fr. August.

Calcareous rocks.—European part: Crimea. Endemic. Described from E. Crimea (Planerno). Type in Leningrad.

697 17. **A. jailicola** (Juz.) Pobed. comb. n.—*Vincetoxicum jailicola* Juz. in Bot. mat. Gerb. Bot. inst. AN SSSR, XIV (1951) 18.—*Cynanchum laxum* auct. fl. taur. non Bartl.—*Vincetoxicum laxum* auct. fl. taur. non Gr. et Godr.

Perennial; stems 20-35 cm long, mostly 2, erect, simple, not twining, glabrous in lower part, biserially covered with short hairs above; leaves ovate to oblong-ovate, the lowest ca. 2 cm long, 1 cm broad, the middle to 6 cm long and up to 3.5 cm broad, rounded or subcordate at base, acute or long-acuminate, the upper 2-4.5 cm long, 0.4-1.5 cm broad, broadly lanceolate, all leaves entire, pubescent on the veins on both sides on the margin and petiole, thickish, herbaceous, paler beneath, revolute, the petioles 2-5 mm to rarely 1 cm long; umbels axillary, loose, few-flowered, 2 per peduncle; peduncles ca. 1 cm long; bracteoles short, narrowly linear; pedicels 2-4 mm long; peduncles and pedicels covered with scattered crisp hairs; flowers 4-5 mm in diameter, yellowish-white; calyx segments lanceolate, obtusish, sparsely ciliate; corolla lobes obtusish, distinctly revolute-margined, 2-2.5 mm long, sparsely and thinly puberulous within; corona shallowly 5-parted; scales of corona widely spaced, triangular, alternate with 5 minute teeth; membranous appendage of anthers hemispherical, as broad as anther; pollinia ovaloid, narrowed at apex, yellow; gland as long as pollinia, slightly enlarged at the top; follicles lanceolate, long-acuminate, glabrous; seeds 5-6 mm long, 3 mm broad, strongly compressed, ovoid, narrow-margined, brown. Fl. June-July; fr. August.

Meadows and grassy places on Crimean yaylas [monoclinal limestone plateaus]. — European part: Crimea. Endemic. Described from Demerdzhi-Yaila. Type in Leningrad.

Related to *A. tauricum* Pobed., which occurs in Staryi Krym and around Simferopol', and differs from that species in the smaller thickened not coriaceous leaves, umbels few-flowered, and 2 per peduncle (not many-flowered and 2 or 3 per peduncle), and presence of teeth between scales of corona.

Series 5. **Officinales** Pobed. — Corolla glabrous within, white or yellowish-white; corona with 5 scales, without or rarely with intermediate teeth; leaves thin, petiolate; stems erect or slightly twining at the tips.

18. **A. officinale** (Moench) Pobed. comb. n. — *Vincetoxicum officinale* Moench, Meth. (1794) 317, s. str.; Decne. in DC. Prodr. VIII, 523, p.p.; Ldb. Fl. Ross. III, 45, p.p.; Steff. Fl. Ostpreuss. (1940) 233. — *V. album* Aschers. Fl. Brand. 3 (1864) 73. — *V. vulgare* Jundz. 698 Fl. lithuan. (1811) 66. — *Asclepias alba* Gilib. Fl. lithuan. I (1781) 44. — *Asclepias Vincetoxicum* L. Sp. pl. (1753) 216. — Ic.: Rchb. Ic. Fl. Germ. XVII, tab. 1067; Yadov. rast. lugov i pastb., Fig. 153. — Exs.: Pl. Finland. exs. No. 1282.

Perennial; stems 50-120 cm long, simple, erect, slightly twining at the tips, biserially pubescent; leaves ovate-lanceolate, all long-acuminate, subcordate or rounded at base, slightly pubescent on the nerves on both sides on the margin and petiole; petioles 0.5-1 cm long; umbels axillary, few-flowered, 1 or 2 per peduncle; peduncles commonly uniserially pubescent, not exceeding the leaf; pedicels as long as or somewhat longer than flower, covered with short crisp hairs; flowers white, 8-10 mm in diameter; calyx segments narrowly lanceolate, 2-2.5 mm long, acute, glabrous or ciliate; corolla lobes 3-4 mm long, 1.5-2 mm broad, oblong or ovate, obtuse, glabrous on both sides; corolla 5-parted to one-third the length; scales obtuse, nearly semicircular, often with 1-3-5 intermediate teeth, slightly exceeding the gynostegium; membranous appendage of anthers rounded, broader than long; pollinia ellipsoid or slightly narrowed at the tip; gland shorter than to equaling the pollinia, enlarged at the top; follicles lanceolate, more or less attenuate at the tip, glabrous; seeds brown, oblong-ovoid, strongly compressed smooth, narrowly hyaline-margined, the margin nearly smooth. Fl. June-July; fr. August (Plate XXXVIII, Figure 2).

Seacoast, coastal belt, scrub, riverbanks, wood margins, and woods. — European part: Lad.-Ilm., Balt., U. Dnp., U. V., V.-Ka., V.-Don, Transv. **Gen. distr.:** Scand., Centr. and Atl. Eur. Described from Scandinavia. Type in Stockholm.

Note. The concept of *A. officinale* s.l. comprised a group of related though clearly distinguishable species.

Economic importance. The plant is poisonous, particularly to smaller animals such as sheep. The roots contain a toxic glucoside vincetoxin (asclepiadin?), $C_{50}H_{82}O_{20}$. In sheep fed experimentally with a daily dose of 30-90 g of fresh herbage, poisoning was observed within three days. Goats, on the other hand, eat this plant very readily, without any ill effects. Pigs never touch it. Used in veterinary medicine for horses and cattle.

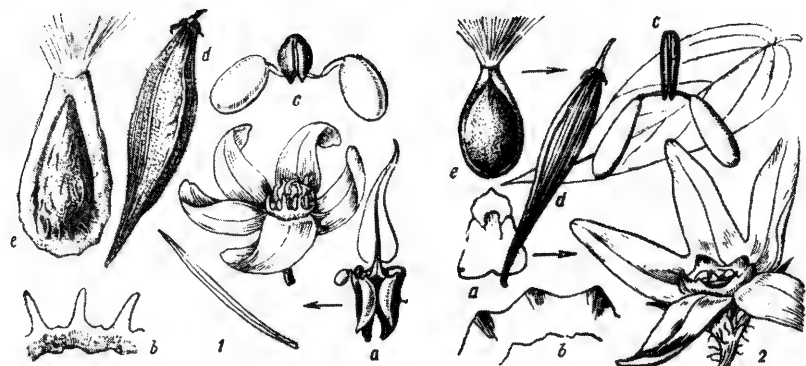


Plate XXXVIII

1. *Antitoxicum sibiricum* (L.) Pobed.— 2. *A. officinale* (Moench) Pobed.— 3. *A. cretaceum* Pobed.— 4. *A. atratum* (Bge.) Pobed.— Annotation of details: a) anther, b) scales of corona, c) pollinia and gland, d) follicle, e) seed.

701 The stem contains very delicate, fairly long and very strong fibers, suitable for weaving. The plant was at one time cultivated for this purpose in Western Europe; it was propagated by root division and not seeded.

19. **A. laxum** (Bartl.) Pobed. comb. n.—*Vincetoxicum laxum* (Bartl.) Gren. et Godr. Fl. franc. II (1850) 480; Rchb. Ic. Fl. Germ. XVII, 17; Nyman, Consp. Fl. Europ. 496; Velenovsky, Fl. Bulg. 379.—*V. officinale* Ldb. Fl. Ross. III (1847-1849) 45, p.p.; Boiss. Fl. or. IV, 54, p.p.; Alb. Prodr. Fl. Colch. 171; Shmal'g.; Fl. II, 208, p.p.; Lipskii, Fl. Kavk. 389.—*Cynanchum Vincetoxicum* β . *laxum* Arcangeli, Fl. Ital. (1894) 365.—*Asclepias Vincetoxicum* Pall. Ind. Taur. (1796) 100; M. B. Fl. taur.-cauc. I, 178.—*Cynanchum laxum* Bartl. in Koch, Taschenb. (1844) 350; Koch, Synops. fl. Germ. ed. II (1844) 555.—*Cynanchum Vincetoxicum* C. A. M. Verz. d. Pfl. (1831) 117; Eichw. Reise casp.-cauc. 22, p.p.; Hohenack. in Bull. Soc. Nat. Mosc. VI, 223, p.p.—Exs.: Fl. exs. Austro-Hung. No. 3741.

Perennial; stem erect or slightly twining at the tip, 30-70 cm long, simple, densely leafy; lower internodes glabrous, the middle uniseriably and the upper biseriably pubescent; leaves ovate, 5.5-11 cm long, 2.5-4.5 cm broad, cordate or rounded at base, long-attenuate and acute, the lower suborbicular, the upper ovate-lanceolate, all short-petiolate, slightly pubescent on the margin, on the midrib on both sides and on the petiole; petioles 0.2-0.5 cm long; umbels axillary, 2 or 3 per peduncle; peduncles commonly shorter than leaves, the upper often exceeding the upper lanceolate leaves, pubescent; pedicels as long as to half as long again as flower, pubescent; flowers pale yellow, 6-8 mm in diameter; calyx segments narrowly lanceolate, glabrous or sparsely ciliate; corolla lobes lanceolate, 3 mm long, narrow, obtuse, slightly inflexed at apex, glabrous, the margin often white-hyaline; corona 5-parted nearly to the middle; scales rounded or acuminate; membranous appendage of anthers broadly ovate; pollinia oblong, narrow, slightly exceeding the pollinia; follicles lanceolate, 3-5 cm long, pointed above translator arm; gland oblong, somewhat attenuate at the tip, acuminate, glabrous; seeds ovoid, brown, smooth, narrowly winged, the margin smooth. Fl. second half of May-July; fr. July-August.

Scrub, woods and stony mountain slopes.—European part: U. Dns., Bl., Crim.; Caucasus: Cisc., W. and E. Transc. **Gen. distr.:** W. Med., Bal.-As. Min. Described from the Adriatic coast. Type in Berlin.

702 **Note.** In Russian floras, this species was usually made to include not merely the Crimean, Caucasian and Black Sea plants, but also the broad-leaved steppe plants which are referred in the present work to a separate species, *V. stepposum* Pobed. Attention must be drawn to specimens of this plant from the Carpathian Mountains, characterized by very large, oblong, thin leaves, as opposed to the ovate, relatively firm leaves of Crimean and Caucasian plants. Specimens from the Crimea and the Caucasus are more like the Adriatic plants.

20. **A. stepposum** Pobed. in Addenda XVII, 752.—*Vincetoxicum officinale* Ldb. Fl. Ross. III (1848) 45, p.p.; Shmal'g. Fl. II, 208, p.p.; Kryl., Fl. Zap. Sib. IX, 2206, p.p.—*V. laxum* Stankov, Opred. vyssh. rast. (1949) 569, non Bartl.; Viznach. rosl. USSR, 346 p.p. non

Bartl.—*Cynanchum Vincetoxicum* Ldb. Fl. alt. I (1829) 279.—*C. laxum* Kunz. in Mater. Fl. Kavk. IV, 1 (1905) 456 p.p. non Bartl.; Grossg. Fl. Kavk. 3, 236, p.p.

Perennial; rootstock short, stout, covered with numerous slender stringy roots; stems several, erect, simple, terete, with one or two broad ranks of short white hairs, pubescent all round at the nodes; leaves ovate, 3.5-8 cm long, 2.5-4.5 cm broad, abruptly narrowed or more or less attenuate, subcordate at base, short-petioled; the margin, the veins on both sides and the petiole pubescent; umbels axillary, many-flowered, 2 per peduncle; peduncles 2-4.5 cm long, mostly exceeding leaves; pedicels half as long again as flower; pedicels and calyx pubescent; flowers yellowish-white, small; calyx segments lanceolate, 1.5-2 mm long; corolla lobes oblong, somewhat narrowed toward apex, obtuse, often hyaline and inflexed at the tip; corona rather shallowly 5-parted; scales of corona large, triangular, widely spaced, occasionally alternate with 5 or with only 2 or 3 very small membranous teeth; membranous appendage of anthers broad, reniform; gland equaling the pollinia, slightly narrowed at base; follicles lanceolate, 5-6 cm long, slightly attenuate at the tips, glabrous; seeds brown, strongly compressed, with a white lighter-colored margin. Fl. May-July; fr. August (Plate XXXVII, Figure 3).

Steppes, steppe mountain slopes, sands, and pine woods.—European part: M. Dnp., Bl., L. Don., L. V., Transv., V.-Ka., Crim.; Caucasus: Cisc.; W. Siberia: U. Tob., Irt. **Gen. distr.:** Centr. Europe. Described from Kinel. Type in Leningrad.

21. **A. cretaceum** Pobed. sp. n. in Addenda XVII, 753. *Vincetoxicum officinale* auct.—*Cynanchum laxum* auct.

703 Perennial; rootstock 4-6 cm long, vertical, covered with gemmae with light-colored obtuse scales and tufts of stringy light brown roots; stems erect, branched from base and throughout their length, 20-30 cm long, biserially pubescent; leaves ovate, acute, not attenuate at apex, 2-3 or rarely 4 cm long, 0.8-1.8 or rarely 2 cm broad, the lower glabrate and pubescent only on the margin, the upper lanceolate and covered with short hairs on the veins on both sides and on the margin; petioles 3-5 mm long, enlarged at base, pubescent; peduncles shorter than leaves, pubescent; umbels solitary or two per peduncle, axillary, 2-4-6-flowered; bracteoles linear, 0.5-1 mm long, pubescent; flowers 6-8 mm in diameter, white (?) or pale yellow (?); calyx segments linear, 1.5-1.8 mm long, glabrous or slightly pubescent; corolla lobes oval, obtuse, 2.5-3 mm long, glabrous; corona rather shallowly 5-parted; scales of corona triangular, occasionally with 1 or 2 obsolescent intermediate teeth; membranous appendage of anthers reniform, broad; pollinia ellipsoid, narrowed at the end; gland about as long as pollinia, enlarged at the top; stigma 5-angled, flat or slightly convex, fleshy; follicles lanceolate, 4-5 cm long, 0.5-0.7 cm broad, short-attenuate at the tip; seeds brown, 3.5-4 cm long, 2.5-3 mm broad, subovaloid, slightly convex, glabrous, narrowly margined. July (Plate XXXVIII, Figure 3).

Slopes of chalk mountains and marls.—European part: V.-Don, Transv., L. Don, Crim.; Caucasus: W. Transc. Endemic. Described from chalk mountains on right bank of Don River (Divnogorsk monastery). Type in Leningrad.

Note. The disjointed distribution area of this species, associated with chalk mountains, points clearly to the antiquity of this species and suggests that it may be a relict. A sample from Bol'shoi Argamysh Plateau, collected on August 15, 1927 (T. Tsirina), while retaining all the characteristics of *A. cretaceum*, differs in having larger leaves and corona with 2 very small teeth on the sides of the scales.

A Gelendzhik specimen from marls has barely discernible teeth between the corona scales, such as characterizes the type material.

Species of uncertain affinity*

22. **A. volubile** (Maxim.) Pobed. comb. n. — *Vincetoxicum volubile* Maxim. Prim. Fl. Amur. (1859) 195; in Mel. Biol. IX, 795. — *Cynanchum volubile* Hemsley in Journ. Linn. Soc. XXVI (1889) 109; 704 Kom. and Alis. Opred. Dal'nevost. kr. II, 875. — *Asclepias dubia* Oliv. in Journ. Linn. Soc. IX (1867) 166. — Ic.: Kom. and Alis. l.c. Plate 260, 3.

Perennial; stem slender, herbaceous, 60-120 cm long, twining, uniseriably pubescent; leaves remote, the upper internodes 3-7 cm long, the lower 15-17 cm long; leaves ovate-lanceolate, 10 cm long and 4 cm broad, short-petioled, the upper linear-lanceolate, 10 cm long and 1 cm broad, subsessile, glabrous or with scattered hairs on both sides and on the margin; umbels axillary, 2-6-flowered, borne all along the stem, loose; peduncles compoundly branched, slender, not exceeding the leaves; pedicels longer than flower; bracteoles minute, lanceolate, ciliate; flowers 12-18 mm in diameter, white; calyx segments lanceolate, 2-3 mm long, ciliate; corolla lobes lance-linear to lanceolate, 6-8 mm long, strongly attenuate at apex, obtuse, 3-4 times the length of calyx, appressed-pubescent within; corona 5-10-parted, shorter than gynostegium; scales of corona triangular, acute, short, widely spaced, alternate with small teeth; pollinia ovaloid, longer than gland; translator arms short and thick; membranous appendages of anthers rounded, curved, equaling the anthers; stigma flat-tish, slightly 2-lobed at center, the upper angles obscure, follicles mostly single or divaricate, seeds ovoid, strongly compressed, brown, 5 mm long, alveolate, the margin irregularly denticulate. Fl. June-July; fr. August-September.

Wet meadows, shores of lakes, sedge and sphagnum marshes. — Far East: Ze.-Bu., Uda, Uss. **Gen. distr.:** Manchuria. Described from lower Amur. Type in Leningrad.

23. **A. atratum** (Bge.) Pobed. comb. n. — *Vincetoxicum atratum* (Bge.) Morr. et Dcne. in Bull. Acad. Brux. (1836) 17; DC. Prodr. VIII, 523; Maxim. in Mel. Biol. IX, 789. — *Cynanchum atratum* Bge. Enum. pl. Chin. bor. (1831) 45; Kom. and Alis. Opred. rast. Dal'nevost. kr. II, 875. — Ic.: Somoku-Dzusetszu, ed. Makino (Iconogr. Pl. Nippon.) IV (1907) 27.

Perennial; the whole plant velutinous-pubescent; rootstock short, stout, brown, with a dense tuft of light brown stringy roots; stems erect, simple, 20-80 cm long, stout, terete; leaves broadly ovate to suborbicular, 5-10 cm long, 3.5-7 cm broad, obtuse or short-acuminate, rounded at base, soft

* Placing the Far Eastern species is difficult without a study of Japanese and Chinese herbarium material, in view of the genetic connections with such material.

to the touch due to pubescence, paler underneath; petioles 0.5-1 cm long; umbels axillary, subsessile; pedicels 8-12 mm long, shorter than or as long as flower; flowers blackish-purple, 20-22 mm in diameter; calyx segments lanceolate, densely pubescent on both sides, 3 mm long; corolla lobes ovate, obtuse, reflexed, 4-5 mm long, 3 mm broad, pubescent outside, glabrous within; corona 5-parted nearly to base, peltiform; scales of corona round, nearly reaching the gynostegium; anthers exerted from corona, the connective with two distinct membranous edges on the ventral side; membranous appendage of anthers rounded, as broad as anthers; pollinia ellipsoid; gland thick, equaling the pollinia and narrowed at the top; translator arms enlarged at the end; stigma 5-angled, compressed; follicles fusiform, thick, short-acuminate, 5.5-7 cm long, 1.5 cm broad, densely pubescent; seeds light brown, strongly compressed, ovoid, 4-6 mm long, 3-4 mm broad, broadly membranous-margined, 0.5 mm broad, the margin smooth. Fl. May-June; fr. July-August (Plate XXXVIII, Figure 4).

Dry meadow mountain slopes, meadows, and scrub.— Far East: Ze.-Bu., Uss. **Gen. distr.:** N. China, Korea, Japan. Described from Chihli Province. Type in Leningrad.

24. **A. amplexicaule** (Sieb. et Zucc.) Pobed.— *Vincetoxicum amplexicaule* Sieb. et Zucc. in Abh. Akad. Münch. IV, III (1846) 162; Maxim. in Mel. Biol. IX, 781; Franch. et Sav. Pl. Jap. (1879) 318.— *Cynanchum amplexicaule* Hemsl. in Journ. Linn. Soc. XXVI (1889) 104; Kom. Fl. Man'chzh. XXV, 286; Kom. and Alis. Oprod. rast. Dal'nevost. kr. II, 875.— *l.c.:* Somoku-Dzusetsu, ed. Makino (Iconogr. Pl. Nippon) IV (1907) tab. 29; Kom. and Alis. l.c. tab. 266, 4.

Perennial; the whole plant glabrous; stems erect, 40-100 cm long, unbranched except at the tip, stout, terete, the branches axillary strict; leaves coriaceous, erect, elliptic to oblong, (5) 7 (10) cm long, (2.8) 3 (5) cm broad, very short-acuminate, cordate at base, sessile, amplexicaul, rigid, narrowly cartilaginous-margined; leaves on branches small, (2) 2.5 (3) cm long, (0.6) 0.8 (1.2) cm broad; inflorescences corymbiform, axillary, lobes at the tip of stem and on branches; peduncles equaling or exceeding the upper leaves of branches; pedicels 5-8 mm long; bracteoles 1-1.5 mm long, lanceolate, ciliate; flowers yellow, 10-12 mm in diameter; calyx segments triangular-lanceolate, 1-1.5 mm long, ciliate; corolla lobes lanceolate, 4 mm long, 0.5-1 mm broad, obtuse, reflexed at apex, white-pubescent within; corona 5-parted nearly to base; scales of corona obovate-spatulate, round-tipped, equaling the gynostegium; membranous appendage of anthers flabellate, about as broad as anther; pollinia clavate, narrowly attenuate at the end, twice the length of the gland; translator arms slender and fairly long; follicles lanceolate, narrow, long-attenuate, 5-8 cm long, 0.8-1.1 cm broad at the broadest part; seeds with a pale ferruginous coma, ovoid, strongly compressed, dark brown, the entire surface very minutely dark grained under strong magnification, the margin nearly smooth. Fl. June-July; fr. August-September.

Meadows in broad valleys, wet meadows, and river floodplains. Described from Japan. Type in Leningrad.

25. **A. acuminatum** (Dcne.) Pobed. comb. n.—*Vincetoxicum acuminatum* Dcne. in DC. Prodr. VIII (1844) 524; Maxim. in Mel. Biol. IX, 786; Franch. et Sav. Enum. pl. Jap. II, 439.—*Cynanchum acuminatifolium* Hemsl. in Journ. Linn. Soc. XXVI (1889) 104; Kom. and Alis. Opred. rast. Dal'nevost. kr. II, 875.—Ic.: Kom. and Alis. l.c., Plate 266, 1.

Perennial, 30-70 cm tall; rootstock stout, short, dark brown to nearly black, with slender stringy roots; stem erect, simple, the lower internodes glabrous, the middle and upper ones uniserially pubescent or vested all round with scattered minute hairs, more densely at the nodes; internodes, especially the lower ones elongated; leaves 11-14 cm long, 5.5-9 cm broad, broadly oval to oval-lanceolate, narrowed at both ends, cuneate or rounded at base, acute but not attenuate at apex, thin, green, paler on the lower side; the margin, the veins and the entire lower surface pubescent, the pubescence dense on young leaves and on petioles; petioles 0.5-1 cm long; umbels axillary, loose, 1 or 2 per peduncle, 3-6-flowered; peduncles 4-5 cm long, exceeding the upper leaves, slender, pubescent; pedicels 2 cm long, pubescent, 3-4 times the length of flower; bracteoles 1 mm long, lanceolate, densely pubescent; flowers white, 15-18 mm in diameter; calyx segments lanceolate, narrow, pubescent; corolla $2\frac{1}{2}$ -3 times the length of calyx; corolla lobes 6-7 mm long, glabrous within, oblong, obtuse; corona shallowly 5-parted, shorter than gynostegium; scales of corona broad, rounded, close together; anthers broad; membranous appendage of anthers broad, rounded, as broad as anther; pollina ovaloid, short; gland thick, short, slightly enlarged below; translator arms slender, as long as pollinia; follicles 5-7 cm long, 0.6-0.8 cm broad, long-attenuate, pubescent; seeds ovoid, 7 mm long, strongly compressed, with dark brown granulation on the convex side, brown, narrow-margined, the margin irregularly crenulate. Fl. second half of May-July; fr. August.

Woods and scrub, chiefly oak woods, stony slopes.—Far East: Ze.-Bu., Uss. **Gen. distr.:** Manchuria, Japan. Described from Japan. Type in Paris.

707 26. **A. inamoenum** (Maxim.) Pobed. comb. n.—*Vincetoxicum inamoenum* Maxim. in Mel. Biol. IX (1876) 787.—*Cynanchum inamoenum* Loes. Beibl. Bot. Jahrb. XXXIV (1905) 60; Kom. Fl. Man'chzh. III, 289; Kom. and alis. Opred. rast. Dal'nevost. kr. II, 875.—Ic.: Miyabe et Miyake, Fl. Saghal. (1915) tab. 10.

Perennial, 30-45 cm tall; rootstock short, yellow to nearly black, with long slender stringy dark brown roots; stems several, erect, simple or slightly branched; lower internodes elongated, with 2 ranks of hairs; other parts of stems covered throughout with short crisp hairs; leaves 7-8 cm long, 3.5-4 cm broad, ovate to elliptic, acute, rounded at base, the lower subcordate, obtuse, the upper paler underneath, ovate-lanceolate, cuneate at base, slightly attenuate at apex, the veins on both sides and the margin and petiole pubescent; petioles 0.5-0.7 cm long; umbels in axils of upper leaves, subsessile, 3-5-flowered; peduncles and pedicels pubescent; pedicels 4-6 mm long, slightly longer than flower; bracteoles linear, 3-4 mm long, pubescent; flowers dingy yellow, 7 mm in diameter; calyx segments slightly pubescent below; corolla 3 times the length of calyx; corolla lobes oblong, obtuse, glabrous, inflexed at apex; corona divergent from gynostegium, 5-parted; scales of corona widely spaced, short, acute;

anthers broad, short, the appendage flat and round; pollinia ovaloid to obovoid, broad, about half the length of the thick elliptic gland; stigma convex, 2-lobed, 5-angled; follicles lanceolate, narrow, 5-8 cm long, 0.5-0.6 cm broad, slenderly long-acuminate, glabrous; seeds 4-5 mm long, 2.5 mm broad, oblong, markedly flattened, slightly convex, glabrous, light brown, narrowly margined, the margin nearly entire, the entire surface alveolate under strong magnification. Fl. June-first half of July; fr. second half of July-September.

Rocky slopes in mixed and oak woods. — Far East: Uss., Sakh. (east coast, Lake Moneron), Endemic. Described from Olga Gulf. Type in Leningrad.

Section 2. **RHODOSTEGIELLA** Pobed in Addenda XVII, 754. — Scales of corona membranous, fleshy in lower part and in sinuses; membranous appendage of anther ovate, attenuate at apex, twice as long as anther.

27. **A. sibiricum** (L.) Pobed. comb. n. — Vincetoxicum
 708 *sibiricum* (L.) Dcne. in DC. Prodr. VIII (1844) 525; Maxim. Prim. Fl. Amur. 474, 483; Ldb. Fl. Ross. III, 46; Maxim. in Mém. Biol. IX, 779; Kryl. Fl. Alt. 828; Fl. Zap. Sib. IX, 2207. — *V. thesioides* Freyn in Oesterr. Bot. Zeitschr. XL (1890) 124. — *Asclepias sibirica* L. Sp. pl. (1753) 217. — *Cynanchum sibiricum* R. Br. in Mém. Wern. soc. I (1809) 48, non Willd.; Ldb. Fl. alt. I, 279. — Ic.: Gmel. Fl. Sib. IV, tab. LXI.

Perennial; rootstock slender, ligneous, brown, with stringy horizontal offshoots; stems several, 15-40 cm long, simple or divaricately branched, slender, herbaceous, densely vested all round with short hairs; leaves linear to linear-lanceolate, 4-7 cm long, 0.3-0.4 cm broad, acuminate, cuneate at base, with prominent midrib, often revolute, densely covered on both sides with short hairs especially on veins and margin, the lower surface paler; petioles 1-2 mm long; umbels 5-6 per peduncle; 3-6-flowered; peduncles short, not exceeding the leaves; pedicels 2-3-times the length of flower; peduncles and pedicels pubescent; flowers 7-8 mm in diameter, yellowish-white; calyx segments oblong, obtuse, pubescent; corolla lobes oblong-ovate, obtuse, reflexed, glabrous, 3-4 mm long, 2-3 times the length of corona; corona membranous, deeply 5-parted; scales of corona lanceolate, obtuse, 2 mm long, alternate with 5 minute but distinct triangular teeth; appendage of anthers acute, attenuate at apex, ovate, 1 mm long, $1\frac{1}{2}$ -2 times the length of anther, with sparse thick cilia; pollinia ovaloid; translator arms horizontal, short, enlarged at the point of attachment to pollinia; gland oval, somewhat shorter than pollinia, slightly narrowed toward base; stigma convex, 2-lobed; follicles fusiform, thick, 5-7 cm long and 0.8-1.8 cm broad, long-attenuate at the tip, covered with very short hairs; seeds ferruginous-brown, with dark brown granules scattered over the surface especially on the convex side, markedly flattened, subellipsoid, 6-8 mm long, 3-4 mm broad, with a broad denticulate margin. Fl. June-August; fr. July-September (Plate XXXVIII, Figure 1).

Sandhills, pine woods, steppe and rocky slopes, and rock crevices. — W. Siberia: U. Tob., Irt., Alt.; E. Siberia: Yen., Ang.-Say., Dau.; Far East: Ze.-Bu., Uss.; Soviet Central Asia: Balkh. (Lake Zaisan area). **Gen. distr.:** Manchuria, Korea, N. China, Mongolia. Described from Siberia. Type in Paris.

Note. Maksimovich (Mém. Biol. IX (1877) 779) distinguishes a northern form of this species — var. *boreale*, characterized by numerous short

stems, with spreading branches often equaling the stems, and a southern form — var. *australe*, with weak few-branched stems attenuate at the tips and often twining, and slightly pubescent, linear to linear-oblong leaves, and few relatively large flowers.

709 Apart from China and Mongolia, the distribution area of var. *boreale* includes some USSR territory in Transbaikalia; var. *australe* occurs only in China and does not penetrate into the Soviet Union.

Genus 1172. **CYNOCTONUM*** E. MEY

E. May. Comm. pl. afr. austr. (1837) 215.

Calyx 5-parted; corolla rotate, 5-parted; corona membranous, tubular, plaited, undivided or 5-10-parted, the inner scales absent. Herbaceous plants, sometimes with twining stems (ours with erect stems) and cordate leaves (the leaves in our species linear or linear-lanceolate); peduncles many-flowered; flowers in umbels.

The genus contains about 30 species, chiefly shrubs, distributed through Africa, tropical America, and India. The one species occurring the USSR, belongs to a monotypic section of this genus.

Section **RHODOSTEGIA** Dcne. in DC. Prodr. VIII (1844) 532. — Corona 5-parted, tubular, plaited, twice the length of gynostegium; subshrubs with erect nontwining stems and large pink flowers.

1. **C. purpureum** (Pall.) Pobed. comb. n. — *C. roseum* Dcne. in DC. Prodr. VIII (1844) 532; Ldb. Fl. Ross. III, 47; Maxim. Prim. Fl. Amur. 196; Diagn. pl. nov. in Mel. biol. IX, 798; Turcz. Fl. baic.-dah. II, 245. — *Asclepias purpurea* Pall. It. III (1776) 260. — *A. davurica* Willd. Sp. pl. I (1797) 1272. — *A. purpurascens* Georgi Besch. Russ. R. III, 4 (1800) 813, non L. — *Cynanchum roserum* R. Br. in Mem. Wern. soc. I (1811) 47; R. et Sch. Syst. veget. VI, 102; Glaus in Goebel It. II, 290; kom. and Alis. Oprod. rast. Dal'nevost. kr. II, 875. — *C. purpureum* (Pall.) R. Schum. in Engl. — Pr. Pflanzenf. IV, 2 (1895) 263.

710 Perennial; root vertical, the thickness of a finger, ligneous, with a thick crown, dark brown, in sandy places forming long horizontal rhizomes; stems several, branched, vested with scattered straight long white hairs; leaves linear to linear-lanceolate, 3-5 cm long and 0.5-5 mm broad, slightly enlarged or cuneate at base, with prominent midrib, covered with scattered hairs on the upper surface and on the margin; petioles ciliate, 3-5 mm long; umbels axillary and terminal, in the forks of the dichasially branched stem, many- or few-flowered; peduncles simple or branched, 3-8 cm long; pedicels 4-6 times the length of flower; peduncles and pedicels more or less covered with scattered long white hairs; bracteoles minute, linear-lanceolate, with long white cilia; flowers 11-12 cm in diameter, pink or pink-lilac; calyx segments narrow, linear-lanceolate, with long white cilia;

* From Greek *kynos* = dog, and *cteinein* = to kill, as the plant was believed to be poisonous to dogs.

corolla 2-2½ times the length of calyx; corolla lobes linear-oblong, obtuse, 3-5.5 mm long and 0.5-1 mm broad; corona tubular, membranous, 4.5 mm long, plaited, 5-lobed at the top, united with gynostegium only at base, overtopping the gynostegium; appendage of anthers broad, nearly round; anthers 1 mm broad, 0.5 mm long; stigma 2-lobed; follicles fusiform, glabrous, 8-8.5 cm long, 1.5-2 cm broad, short-acuminate; seeds brown, strongly compressed, broadly margined, the margin coarsely denticulate, the whole surface covered with dark brown granulation. Fl. May-mid June; fr. June (Plate XXXIX, Figure 2).

Dry rocky slopes, oak scrub, and pine woods on sands.— E. Siberia: Ang.-Say., Dau.; Far East: Ze.-Bu., Uss. **Gen. distr.:** Mongolia (N.), Manchuria, N. China (vicinity of Peking), Korea. Described from the vicinity of Irkutsk. Type in London.

Note. This species occupies a unique position in the genus *Cynoctonum*, comparable to the position of the species *A. sibiricum* in the genus *Antitoxicum*. Its distribution area is isolated from the general distribution area of the genus which does not spread to the east beyond India. This species should possibly be set up as a distinct genus, in analogy to the North American genus *Seutera* that has also been separated from the genus *Cynoctonum*; this, however, will only be possible following a critical review of the entire tropical genus *Cynoctonum*.

Genus 1173. **SEUTERA** * RCHB.

Rchb. Consp. (1828) 131.

713 Calyx 5-parted, with lanceolate acute segments; corolla subspherical, with short tube and 5 spreading acute glabrous lobes; corona 5-parted, united with gynostegium only at base; scales of corona erect, slightly thickened, flattish, inner scales absent; pollinia attached to gland by translator arms; stigma conical, slightly biparted; follicles smooth; seeds comose. Seacoast plants with slender twining glabrate stems; umbels with axillary peduncles.

The genus contains only two species — one distributed along the seacoast of North America, the other along the Pacific coast of east Asia.

1. *S. Wilfordii* (Franch. et Sav.) Pobed. comb. n.— *Vincetoxicum Wilfordii* Franch. et Sav. Enum. Pl. Jap. II (1876) 445.— *Cynoctonum Wilfordii* Maxim. in Mel. Biol. IX (1876) 799; Hook. f. Fl. Brit. Ind. IV, 25.— *Endotropis auriculata* Franch. et Sav. l.c. 319, non Decne., nec Miq.

Perennial; stem twining, firm, ribbed, glabrous; leaves deeply cordate, with a deep sinus and two prominent lobes at base, 4-8 cm long and 4.5-5.5 cm broad, long-acuminate at apex, coriaceous, entire, with a network of prominent light-colored veins, covered on both sides with scattered short hairs, more densely hairy on the veins and on the petiole; petioles 4.5 long; umbels extra-axillary simple or branched; peduncles densely white-pubescent, 2.5-5 cm long; pedicels twice the length of flower, densely white-pubescent; flowers yellow, 1.5 cm in diameter (in dry condition); calyx segments ovate-lanceolate, half the length of petals,

* Named after the Dutchman M. Seuter, author of a study on the genus *Paris*, or possibly that J.G. Seuter who wrote about ancient cultures in the years 1799-1810.

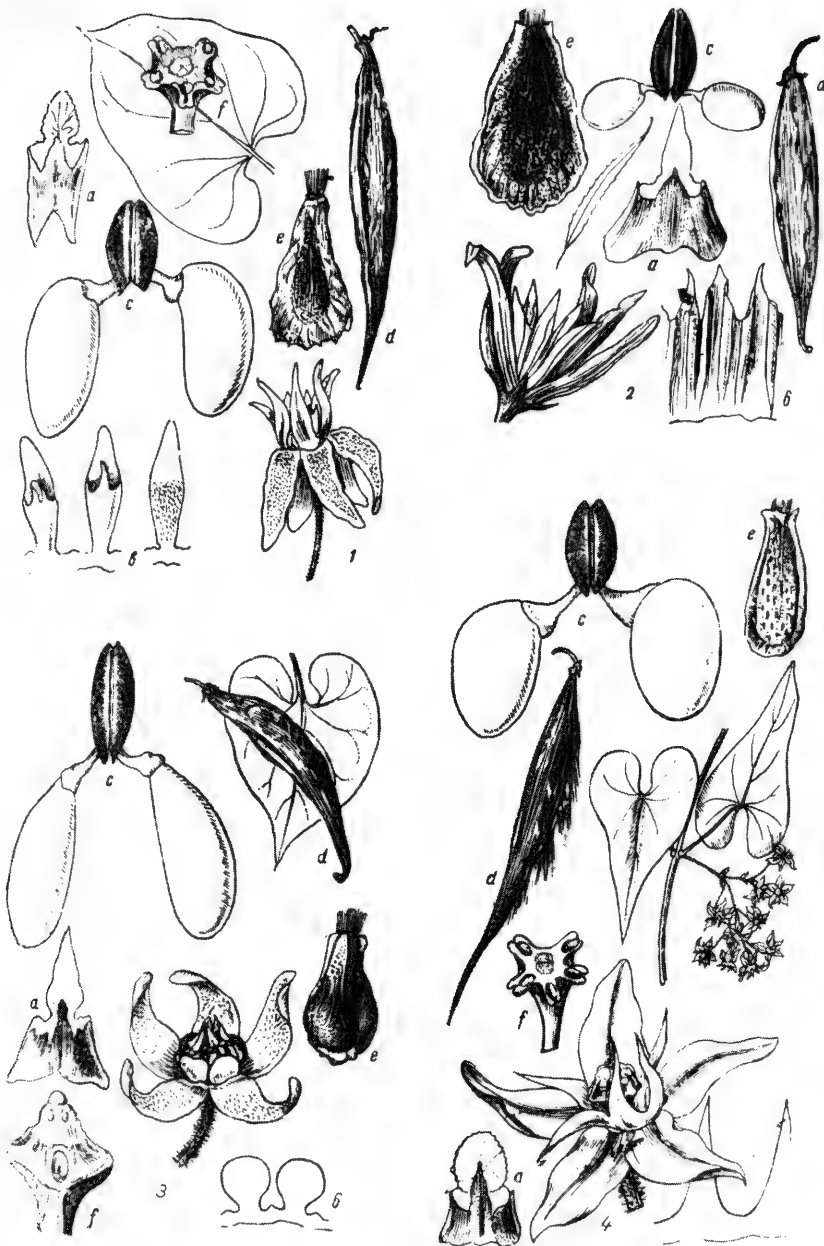


Plate XXXIX

1. *Cynanchum Maximoviczii* Pobed.— 2. *Cynoctonum purpureum* (Pall.) Pobed.— 3. *Seutera Wilfordii* (Franch. et Sav.) Pobed.— 4. *Cynanchum stellatum* Pobed.— Annotation of details: a) anther, b) scales of corona, c) pollinia and gland, d) follicles, e) seed, f) stigma.

1.5-2 mm long, narrowed at base; corolla lobes ovate, obtuse, 3 mm long, densely covered within with short hairs; corona united only at base, membranous, rarely nearly free, fused with gynostegium only at base; scales of corona rounded, 1-1.5 mm in diameter, abruptly narrowed at base; anthers with 2 ribs on ventral side and 2 sharp teeth at the tip; membranous appendage of anthers ovoid, acute; pollinia ovaloid, short, slightly exceeding the gland; stigma 5-angled, conically umbonate, 2-lobed; follicles narrowed at both ends, 9-10 cm long and 1-1.5 cm broad, slightly attenuate toward apex, with scattered hairs (more numerous in young flowers); seeds ovoid, light brown, broadly margined, slightly denticulate, the margin with thinly scattered minute dark granules. Fl. July; fr. August-September (Plate XXXIX, Figure 3).

Stony soil on exposed sunny mountain slopes. — Far East: Uss. **Gen. distr.:** Korea, Japan. Described from Japan. Type in Paris.

Note. In specimens of this species from Japanese islands, the leaves are thin, herbaceous, while in plants from the mainland (Korea and Maritime Territory) they are thick and coriaceous.

714

Genus 1174. **CYNANCHUM*** L.

L. Sp. pl. (1753) 212.

Calyx 5-parted nearly to base, with ovate scales; corolla rotate, deeply 5-parted; corona membranous, often plaited, united, tubular-campanulate, cupuliform or cleft nearly to base, mostly inclosing the gynostegium, with 5 outer scales and 5 inner scales opposite the outer ones or rarely inner scales absent; membranous appendage of anthers nearly always rounded; pollinia globose or ellipsoid; translator arms short, broad, trigonous; stigma 5-angled, with depressions at angles serving as repositories for the glands, slightly convex, with two globose appendages; follicles smooth, single, the other mostly abortive; seeds comose. Perennial plants with twining stems and deeply cordate opposite leaves.

A small genus, with 5 species and two distribution areas: E. Asia — 3 species; Soviet Central Asia — 2 species.

1. Leaves ovate, short-acuminate, 7-8 cm long, 5-6 cm broad; calyx segments glabrous or very slightly pubescent, obtuse or short-acuminate; corolla lobes 4 mm long; corona with 5 membranous oval obtuse outer scales and 5 inflated triangular inner scales; stigma with globose glands at angles; follicles fusiform, 7-9 cm long, 0.9 cm broad. 4. **C. Maximoviczii** Pobed.
- + Leaves deeply cordate or ovate, 4.5-10 cm long, 2.5-8 cm broad; calyx segments ovate or lanceolate, densely pubescent; corolla lobes 5-7 mm long; corona with membranous linear outer scales and ligulate inner lobes or inner lobes absent; stigma without globose glands at angles; follicles linear, 7-16 cm long and 0.5-0.8 cm broad. 2.
2. Corona with 5 broad triangular scales alternate with 5 broad membranous interstices, without inner scales. 3. **C. stellatum** Pobed.
- + Corona with inner scales, the membranous interstices between the scales narrower. 3.
3. Leaves narrow, long, with broad, nearly rounded, widely spaced basal lobes; corona with short ligulate or rarely long lanceolate inner

* From Greek kynos = dog, and anchein = to strangle, as the plants were supposed to poison dogs.

- appendages; follicles linear, narrow, 12.5-16 cm long, long-acuminate (Soviet Central Asia). 2. *C. sibiricum* Willd.
- 715 + Leaves shorter and broader, the basal lobes shorter, commonly descending and parallel; corona never without inner appendages, these mostly long lanceolate, rarely short ligulate; follicles 6-15 cm long, 0.5-0.8 cm broad (Caucasus: European part). 1. *C. acutum* L.

1. *C. acutum* L. Sp. pl. (1753) 212; M.B. Fl. taur.-cauc. I, 177; Dcne. in DC. Prodr. VIII, 547; Ldb. Fl. Ross. III, 48, p.p.; Boiss. Fl. or. IV, 60; Grossg. Fl. Kavk. III, 235.—*C. monspeliacum* L. Sp. pl. (1753) 212.—*C. longifolium* Mart. Reise Vened. II (1824) 570.—*C. acutum* var. *longifolium* Grossg. l.c. 236, non Mart.

Perennial; stems very long, twining and contorted, slender, terete, glabrous or sparsely covered with short hairs especially at the nodes; leaves ovate or rarely triangular-ovate, 4.5-10 cm long, 4-8 cm broad, cordate, with more or less approximate basal lobes, short-acuminate or rarely acute, long-petioled, glabrous or, especially when young, covered with scattered short hairs; petioles 2.5-7 cm long, flattish, slightly canaliculate, enlarged at base, pubescent; peduncles 5-10 cm long, slightly caniculate, pubescent, externally grooved; corymbs simple or compound, mostly ternate, on short or long branched peduncles; pedicels twice the length of flowers, pubescent; bracteoles minute, linear, acute; pedicel and calyx pubescent; flowers 6-8 mm in diameter; calyx and corolla deeply cleft; calyx segments ovate, 2-2.5 mm long, 0.5-1 mm broad, obtuse, often reddish; corolla lobes oblong, 4-5 mm long, 1.5-2 mm broad, obtuse or round-tipped, hyaline-margined, glabrous, pinkish or white; corona cupshaped, surpassing the gynostegium, with 5 narrow linear scales and 5 similar shorter inner scales opposite the outer ones, the interstices between scales broad semicircular or toothed; anthers short and broad or longer, mostly exceeding the gynostegium; membranous appendages of anthers rounded-elliptic or ovate, in the case of short anthers longer than the anther; stigma convex, with 2 short thick lobes, 5-angled, with depressions for the glands at the angles; pollinia very small, ovaloid to subglobose; translator arms short, triangular; gland ovate, as long as pollinia; follicles linear, 6-15 cm long, 0.5-0.8 cm broad, often arched-recurved along spinal suture, acutely attenuate at apex, puberulous especially when young; seeds ovoid, strongly compressed, 6-7 mm long, 2-2.5 mm broad, light brown, broadly margined, the lower margin entire or denticulate, the surface covered with lighter-colored granulation. Fl. June-July; fr. August-September.

- 716 Seacoasts, sandy and solonchak sites in steppes, riverbanks, and mountain slopes.—European part: Transv., Bes., Bl., Crim., L. Don, L. V.; Caucasus: all regions. **Gen. distr.:** Med. (W. and E.), Bal.-As. Min., Arm.-Kurd. Described from Sicily. Type in London.

Economic importance. A poisonous plant. The active substance is primarily the glucoside vincetoxin.

The leaves and stems contain rubber, but the plant is not used for rubber extraction.

May be used for fixation of seaside sands and coast consolidation.

Note. The species is exceptionally polymorphic, all parts of the plant being subject to variation. Within the range of variability in the Caucasus, a noteworthy form is *C. acutum* var. *macrophyllum* Grossh.

Insufficiency of material (a single leaf from Gori and another one from Karabakh Steppe) precludes a detailed description. The plant is distinguished by very large, very thin, rounded, obtuse or round-tipped leaves 16-17 cm long and 13-16 cm broad, the base of leaf deeply cordate with approximate lobes; leaf blade, petioles and peduncles glabrous; corolla lobes narrow, 7 mm long; corona cup-shaped, with very short rounded scales and large teeth in the interstices.

2. *C. sibiricum* Willd. in Ges. Naturf. Fr. Neue Schr. II (1779) 124, non R. Br.—*C. acutum* Ldb. Fl. alt. I, 278; Kryl. Fl. Zap. Sib. XI, 2208.—*C. longifolium* Dcne. in DC. Prodr. VIII (1844) 547, non Mart.—*C. acutum* β . *longifolium* Ldb. Fl. Ross. III (1847-1849) 48; Boiss. Fl. or. IV, 60.—Ic.: Willd. l.c. tab. 5, f. 2.

Perennial; leaves 5.5-10 cm long, 2.5-3 cm broad, ovate, narrowly attenuate toward apex, acute, deeply auriculate-cordate, the basal lobes rounded, broadly or rarely horizontally spreading, covered with scattered short hairs; flowers red or reddish; calyx segments ovate, acute, pubescent; corolla lobes oblong, obtuse to subacute; corona cup-shaped, with long outer scales and short ovate sometimes obsolescent and rarely long linear inner scales; anthers elongate, longer than the membranous appendage or very short and only half the length of appendage; follicles 12.5-16 cm long, slenderly long-acuminate, rarely smaller, more hairy than in *C. acutum* L., otherwise not differing from it. Fl. second half of May-August; fr. August-September.

In tugaic soils along the banks of rivers and brooks, irrigation canals, alluvial and dune sands, often as weed of cucurbitaceous crops.—

717 W. Siberia: Irt., Alt.; Soviet Central Asia: Ar.-Casp., Balkh., Dzu.-Tarb., Kyz. K., Kara K., Mtn. Turkm., Amu D., Syr. D., **Gen. distr.:** Kashgaria, Mongolia. Described from Siberia. Type in Berlin.

3. *C. stellatum* Pobed. in Addenda XVII, 754.—*C. acutum* auct. fl. Asiae Mediae.

Perennial; rootstock, stout, 1.5-2 cm thick, ligneous, light grayish-yellow; stems numerous, twining, slender, 1-2 mm thick, green or pale yellowish, with thinly scattered hairs, more hairy at the nodes; leaves ovate, 3-6 cm long, 1-2.5 cm broad, obtusely triangular and short-pointed at apex, auriculate and deeply cordate, the basal lobes widely or rarely horizontally spreading, the margin veins petiole and the entire lower surface covered with scattered hairs; leaf blade half as long again to twice as long as the petiole; corymbs compound, 2 or 3 per peduncle or on its short ramifications; peduncles 2-3 cm long, pubescent; pedicels twice the length of flower, pubescent; flowers pinkish, 4-5-6 mm long; calyx segments ovate, acute, pubescent; corolla $2\frac{1}{2}$ -3 times the length of calyx segments; corolla lobes oblong, 4-6 mm long; corona cup-shaped, with 5 triangular slenderly attenuate acute scales, without internal appendages, with broad membranous interstices between the scales; anthers very short, broader than long, shorter than than the broadly ovate membranous appendage; stigma convex, with 2 short thick lobes, 5-angled, with depressions for glands; pollinia orange, half as long again as the gland; translator arms short, horizontal, triangularly enlarged; fruits unknown. June-August (Plate XXXIX, Figure 4).

Mountain slopes.—Soviet Central Asia: Pam.-Al. Described from Zeravshan (Takfan). Type in Leningrad.

4. **C. Maximoviczii** Pobed. nom. n.—*Cynanchum caudatum* Maxim. in Mel. Biol. IX (1876) 808 et in Bull. Acad. Sc. Petersb. XXIII (1877) 375, non Vell. (1827).—*Endotropis caudata* Miq. in Bull. Mus. bot. Lugd.-Bat. II (1867) 128.

Perennial; stem slender, stringy, twining, contorted, herbaceous, glabrous, slightly thickened at nodes, the internodes long; leaves broadly ovate, 7-8 cm long, 5-6 cm broad, short-acuminate at apex, cordate at base with a fairly shallow sinus, glabrous or minutely puberulous on the margin, pale green on the underside; petioles 3.5-7 cm long, canaliculate with convergent margins, slightly dilated at point of insertion on the stem, glabrous or covered with short hairs; peduncles extra-axillary, equaling or slightly exceeding the petioles; peduncles and pedicels pubescent; 718 corymbs many-flowered, simple; pedicels slender, recurved, $2\frac{1}{2}$ -3 times the length of flower; flowers yellowish (?), 7-8 mm in diameter; calyx segments broadly oblong, obtuse to short-acuminate, 2 mm long, glabrous or very slightly pubescent at base; corolla lobes oblong to oval, 4 mm long, obtuse, hyaline-margined, with 5 long membranous oval obtuse outer scales surpassing the gynostegium; inner scales inflated, triangular, attenuate at apex, obtuse, opposite the outer scales and forming together with them a deep pocket; gynostegium short; anthers elongate, $2\frac{1}{2}$ times as long as the ovate acute membranous appendage; pollinia orange, ovaloid, slightly exceeding the gland; translator arms enlarged at the point of attachment to pollinia; stigma 5-angled, 2-lobed at center, depressed at the top, with globose appendages, 7-8 mm long; follicles fusiform 7-9 cm long, slenderly long-attenuate at the tip, glabrous; seeds strongly compressed, 5-6 mm long, ovoid, broadly margined, coarsely denticulate at base. Fl. July-August; fr. September (Plate XXXIX, Figure 1).

Mountain slopes, valleys of mountain streams, and seacoasts.—Far East: Sakhalin. **Gen. distr.:** Japan, China. Described from Japan. Type in Leningrad.

DIAGNOSES PLANTARUM NOVARUM IN TOMO XVIII FLORAE URSS COMMEMORATARUM *

(DIAGNOSIS OF NEW SPECIES MENTIONED IN VOLUME XVIII)

Novembri 1952

RHODODENDRON L.

1. *Rh. hypopitys* Pojark. sp. n.

Frutex sempervirens ramosus ca. 1 m altus cortice fusco-cinereo. Ramuli hornotini annotinique rubro-fusci 4—8 mm diam., breviter pubescentes. Gemmae magnae, foliiferae conicae ca. 1.5 cm longae et 6 mm diam., floriferae subglobosae ca. 17 mm longae et 14 mm diam.; perulae multiseriatae, exteriores coriaceae, juventute sparse pilosae, ovatae, apice in mucronem abrupte angustatae, ceterae dense longeque appresse pilosae, mediae oblanceolatae, interiores lineares, omnes caducae vel nonnullae persistentes. Folia (6)9—15.5 cm longa et (2)3—7 cm lata, coriacea, supra saturate viridia, subtus pallidiora, utrinque glabra, oblongo-elliptica vel oblanceolato-elliptica, basi sensim cuneatim angustata, apice breviter acutata cum apiculo calloso, margine plana vel leviter revoluta, utrinque distincte reticulatim venosa; petioli crassi, breviter pubescentes lamina 4—10-plo breviores. Inflorescentia terminalis corymboso-umbellata; pedunculi (3)4—6 cm longi, ferrugineo-tomentosi, in axillis squamarum inserti. Calyx breviter truncatus 3—3.5 mm diam. levissime 5-dentatus, ferrugineo-tomentosus. Corolla late campanulata, flava, in sicco plus minusve viridescens, ca. 3 cm longa 4—4.7 cm diam., ad medium in lobos 5 late-ellipticos ovatosve, obtusos, margine leviter undulatos dissecta; stamina 10, inaequalia, quam corolla breviora, filamentis basi pilosis, antheris ellipticis; stylus corollae subaequalis; ovarium ferrugineo-tomentosum. Pedunculi fructiferi ca. 7—8 mm longi; capsula 13—17 mm longa cylindracea vel ovato-cylindracea, fere recta.

Planta silvatica: praecipue abietorum et piceetorum, rarius laricetorum incola.

Area geographica: Asia orientalis, in regione fl. Amur inferioris nec non in declive orientali jugi Sichote-Alinj.

Typus: in parte septentrionali jugi Sichote-Alinj, in systemate fl. Tumnin, ad fontem rivuli Largashi, 1934, fl. leg. V. Soczava; typus in herb. Inst. bot. nom. V. Komarovii Ac. Sc. URSS conservatur.

A *Rh. aureo* foliis 2—3-plo majoribus, margine planis vel leviter revolutis, ramis multo longioribus crassioribusque, internodiis elongatis, squamis gemmarum vulgo omnibus deciduis (non diu persistentibus) nec non habitatione diversa differt.

* [This appendix has been reproduced photographically from the Russian original.]

2. *Rh. sichotense* Pojark. sp. n.

Frutex diffuse ramosissimus, cortice atrocinereo, ramulis juvenilibus erectiusculis virgatis ad apicem ramorum congestis, rubrofusciis, breviter pubescentibus et plus minusve glanduloso-lepidotis. Folia hiemantia, molliter coriacea, crassiuscula, supra atroviridia, olivacea, subtus primum pallida flavoviridia, deinde ferruginea, utrinque dense glandulis sessilibus tecta, supra ad nervum medium breviter pubescentia, elliptico-ovata, rarius elliptica, basi late- vel rotundato-cuneata, apice obtusa, saepe emarginata et cum apiculo calloso brevissimo obtusatoque, margine subintegerrima vel obsolete obtuse denticulata, 1.7—3.5 cm longa, 0.9—2 cm lata, ramorum sterilium ad 4.5 cm longa et 2.3 cm lata, non raro oblongo-elliptica; petioli pubescentes lepidotique, quam lamina 5—10-plo breviores. Gemmae floriferae laterales, uniflorae, aphyllae, in axillis foliorum superiorum per 1—4 aggregatae. Pedunculi 0.5—0.7 mm longi, basi squamis imbricatis diu persistentibus fulti. Calyx 2—2.5 mm diam. lepidotus, dentibus 5 rotundatis inconspicuis glabris. Corolla late infundibuliformi-campanulata, tubo brevissimo violaceo-rosea, extus puberula, 2.1—2.7 cm longa, 3—4 cm diam., ad medium in lobos rotundato-ovatos vel late-ellipticos obtusos, basi nonnunquam breviter unguiculatos, marginibus inter se tegentos secta; stamina 10, superiora quam corolla breviora, inferiora vix exserta, curvata, filamentis basi villosis, antheris oblongo-ellipticis violaceo-purpureis; stylus staminibus longior purpureus, stigmate nigro-purpureo, ovarium lepidotum. Capsula oboblongo-cylindracea vel cylindrico-ovata, 9—13 mm longa, 3—4 mm lata, recta vel nonnunquam curvata.

In declivibus montanis saxosis, in rupestribus, in detritis lapidosis in silvis montanis atque in regione subalpina.

Area geographica: Asia orientalis, reg. Ussuriensis, in declivi orientali jugi Sichote-Alinj nec non in declivibus litoris maris Japonici et freti Tatarski.

Typus: Reg. Ussuriensis circa sinum Olgae, 28 IV 1913, fl. V. Bjeloussov; in herb. Inst. bot. nom. V. Komarovii Ac. Sc. URSS conservatur

Haec species *Rh. Ledebourii* Pojark. habitu praecipue similis, a quo foliis majoribus et eorum forma diversa, corolla rosea lobis latioribus inter se tegentibus discrepat; a *Rh. mucronulato* Turcz., quo florum forma et colore propinqua, foliis hiemantibus (non caducis) multo latioribus obtusis olivaceis, nec non pilis strigosis deficientibus diversa.

3. *Rh. Ledebourii* Pojark. sp. n.

Frutex ramosissimus 0.5—1.5 m altus, ramis erectiusculis, cortice atro-cinereo; ramuli juveniles tenues breves fusci vel rubro-fusci, brevissime pubescentes et plus minusve glanduloso-lepidoti. Folia molliter coriacea, hiemantia, supra olivacea, lucida, disperse lepidota, subtus dense

723 *lepidota juvenilia pallida luteo-viridia, demum ferruginea, ovato-elliptica vel elliptica, nonnulla obovata vel oblongo-elliptica, (0.6)0.8—2.7 cm longa, (0.4)0.5—1.3 cm lata, obtusa non raro emarginata cum apiculo calloso, margine obsolete crenata, ramorum steriliū elongatorum nonnunquam ad 3—4 cm longa et 1.6—2 cm lata; petioli 3—5-plo lamina breviores. Gemmae floriferae aphyllae laterales uniflorae, in axillis foliorum superiorum per 1—3 aggregatae. Pedunculi breves gemmarum perulis imbricatis diu persistentibus fulti. Calyx ca. 2 mm diam., dense lepidotus, dentibus 5 rubescentibus glabris, 0.5—1 mm longis; corolla pallide violacea, 1.6—2.2 cm longa late campanulato-infundibuliformis, tubo brevissimo, profunde, ad $\frac{2}{3}$ — $\frac{3}{5}$ in lobos praecipue elongatos ellipticis vel ovatos, obtusos, exungiculatos vel breviter unguiculatos fissa, limbo amplo 2.8—4.5 cm diam., stamina 10 paulum exserta, filamentis purpureis basi barbatis; antheris ellipticis roseo-violaceis, ovarium leviter quinque-angulatum, dense lepidotum, stylo curvato, quam stamina longiore, glabro. Capsula oblongo-cylindracea, 7—10 mm longa, 3—4 mm lata.*

In sylvis montanis (plerumque in laricetis) et in regione subalpina in locis lapidosis, in rupibus, detritisque nec non in declivibus ripariis.

Area geographica: montes Altaici et Sajanenses.

Typus: Altai, prope ostium fl. Kainci in declivi lapidoso, 11 VII 1915, fl. et fr., leg. P. N. Krylov; in herb. Inst. bot. nom. V. Komarovii Ac. Sc. URSS conservatur.

A *Rh. dahurico* foliis hiemantibus, non deciduis atroviridibus, corolla intensius violaceo colorata differt.

PRIMULA L.

4. Sectio **Julia** Fed. et A. Los. sect. n.

Calyx transverse angulato costatus. Corollae tubus calyce duplo longior. Flores solitarii, pedunculis elongatis radicalibus. Scapus nullus, Folia reniformia basi cordata, in petiolum longum anguste alatum abrupte contracta, glabra tenera margine grosse cuneato-dentata.

Sectionis typus: *P. Juliae* Kusn.

5. **P. Kusnetzovii** Fed. sp. n.

Rhizoma breve, radicibus pluribus atrofusis praeditum, foliis submembranaceis rosularibus eximie petiolatis, late ovatis vel oblongis basi subcordatis vel subcuneatis apice obtusis margine irregulariter sinuato-dentatis fere sublobulatis rugosis et undulatis supra glabriusculis subtus griseo vel incano vel rarius albo tomentosus, 3—4 (5) cm longis, 2.5—3 (4) cm latis, in petiolum sublongiorem abrupte attenuatis, scapis numerosis vel solitariis gracilibus folium duplo superantibus in umbellam pauciradiatam abeuntibus. Flores magni ca. 1.5—2 cm in diam. purpurei, involucri phyllis linearibus, pedicellis hirtulis vel subglabris gracilibus elongatis, 2—2.5 cm longis. Calycis tubus anguste cylindricus hirtellus vel subglaber ad costas

724 *subangulatus* fere usque ad medium in denticulos lineari lanceolatos acuminatos partitus. Tubus corollae calyci aequilongus in limbum subconca-
vum transiens, lobis late obcordatis apice bipartitis. Capsula cylindrica
e calyce vix exserta vel eum aequans. VI—VII.

Ab affinibus *P. amoenae* M. B. et *P. Meyeri* Rupr. praecipue foliis
subtus tomentosis margine sinuato dentatis et fere sublobulatis eximie differt.

Habitat in regione alpina non procul ab nivibus deliquescentibus.

Typus: „Ossetia. Ad utraque latera montis Kariuchoch, praecipue
ad pedes rupium, in glareosis, rarius in pratis alpinis. 6 VI 1890, n° 578.
Leg. N. Kusnetzov“.

Area geographica: Caucasus magnus, praecipue occidentalis
et montes Lasistaniae.

6. *P. poloninensis* (Domin) Fed. sp. n.—*P. elatior* var. *carpatica*
f. *poloninensis* Domin. in Veda Prir. XI (1930) 241 et in Domin et Kra-
jina, Fl. Čechoslov. exs. n° 285.

Planta pilis albidis fere tota obsita, rhizomate abbreviato, foliis
oblongo ellipticis, conspicue crenato dentatis, praesertim subtus ad nervos
pilis elongatis hirsutis, rugosis, nervis parallelis rectis densis in angulo
fere recto divaricatis percursis, basi non cordatis sed sensim vel subabrupte
in petiolum late alatum et grosse dentatum lamina breviorum abeuntibus.
Scapi recti foliis longiores pilis albidis elongatis dense obsiti. Calyx bre-
vis sub anthesi paulum ventricosus dein ventricosus campanulatus. Flores
lutei majusculi, ca. 2 cm in diam. Tubus corollae ad tertiam partem
calycem superante, lobis obcordatis bilobulatis. Inflorescentia umbellata,
involucris phyllis fusciscentibus calyce triplo brevioribus, ca. 1 cm longis.

Affinis est *P. Pallasii* Lehm. (nec *P. carpaticae*), a qua differt
imprimis pubescentia densa hirsuta atque foliorum margine crenato-dentata
(nec sinuato-dentata).

Typus: Fl. Čechoslov. exs., n° 285. „Rossia subcarpatica orientali
borealis: montes Svidovez, in declivi austro-orientali, jugi infra montem
Bliznice in Festuceto carpaticae, solo calcifero formationis «Flysch» dicto,
altitudine circa 1650 m s. m. 26 V 1930. Leg. Mil. et Frant. Deyl“.
Adnotatio Dominis: „haec in ditione Carpatorum orientalium, praesertim
in montibus Svidovez dictis divulgata esse videtur et etiam in montibus
Pietroš et Hoverla a me collecta sunt“.

Area geographica: Montium Carpathorum orientalium species
endemica videtur.

7. *P. pamirica* Fed. sp. n.

Efarinosa glabra, habitu robusto, foliis rosulam saepe densam
formantibus, obovato spathulatis apice rotundatis vel subacuminatis
in petiolum duplo longiorem alatum sensim (nec subito) attenuatis crassi-
usculis et interdum subcoriaceis, 3—5(7) cm longis, 0.6—0.7(1.5) cm
latis; scapis elongatis, 15—20(30) cm longis, crassiusculis inconspicue

725 striatulis post anthesin valde increscentibus apice in umbellam multiradiatam densam abeuntibus; umbellae radiis inaequalibus, 1—2(5) cm longis, involucrum duplo sesqui superantibus apice nigro punctulatis; phyllis oblongis, 7—10(12) mm longis, mucronulatis basi auriculatis glanduloso nigro punctulatis. Calyx tubulosus ad tertiam partem in denticulos lanceolatos incisus, dentibus subpatentibus mucronatis vel retrorsum incurvatis intense nigro glanduloso punctulatis. Corollae tubus calyce duplo longior in limbum pallide roseum, 1.5—2 cm in diam., ampliatus, lobis obcordatis profunde bipartitis. Capsula oblonga dentibus lanceolatis subacutis maturitate dehiscentibus terminata. Semina laevia castnaea irregulariter angulata. V—VII.

A *P. sibirica* Jacq. scapis multifloris rosulisque densis, foliis in petiolum sensim (nec subito) attenuatis crassiusculis, involucris phyllis calycibusque intense glanduloso nigro punctulatis et habitu robustiore sat diversa. Plus minus affinis *P. involucratae* Wall.

Typus: Pamiria, ad ripam australem l. Kara-Kul. 5 VII 1913, O. Knorring.

Area geographica: in Asia media montosa, in regionibus Pamiralaicis et Tjan-Schanicis, usque ad Kaschgariam Afghaniamque distributa. In Tadzhikistania abest.

8. *P. pinnata* M. Pop. et Fed. sp. n.

Parvula, 3—8 cm alta, glabra. Rhizoma brevissimum subnullum, fibris radicalibus albis elongatis provisum. Rosulae foliorum radicalium densae parvae, 1—3 cm in diam.; folia glabra, 0.8—2 cm longa, petiolis laminae aequilongis vel paulo longioribus versus basin sensim dilatatis et intense coeruleis; glabris; laminis anguste oblongis vel lanceolatis fere ad medium pectinato inaequaliter laciniato-pinnatifidis, laciniis parvis sublinearibus interdum deorsum subfalcatis; apice folii triangulari integra acuta. Scapi 3—8 cm alti, erecti, firmi, glabri; umbella 2—10-flora, scapo duplo triplove brevior, fasciculata (fructifera); bracteae e basi ovato-triangulari submembranaceae lineari-subulatae, glabrae, pedicellis subduplo longiores; pedicelli firmi glabri, 4—8 mm longi, erecti; calyx glaber campanulatus, 3—4 mm longus; subpentagonus, fructifer fere immutatus, ejus dentes tubo campanulato subaequales e basi ovato-triangulari lanceolato-lineare, acuti; corolla (purpureo-coerulea?), tubo 4—5 mm, lobis late obtriangularibus usque ad $\frac{1}{3}$ — $\frac{1}{2}$ bilobis; lobis bidentatis dente exteriori majore, interiore 3—4-plo minore; capsula cylindrico-oblonga, calyce $1\frac{1}{2}$ -plo longior, 4—5 mm longa, fuscescens, dentibus 5 obtusis crassiusculis brevibus dehiscens; semina ovalia fusca, $\frac{1}{2}$ — $\frac{1}{4}$ mm in diam., testa laevi.

Plus minusve affinis *P. giganteae* Jacq., sed differt foliis setuloso-denticulatis fere pinnatis, inflorescentiis oliganthiis et statura minore.

Crescit ad lacum Baicalem prope pagum Sarma (Mare parvum), in cobresieto humido. Fr. mat. 25 VIII 1951, leg. M. G. Popov.

9. *P. Iljinskii* Fed. sp. n.

Planta efarinosa glabra gracilis, foliis omnibus rosularibus oblongo spathulatis vel obovatis in petiolum angustum duplotriplove longiorem gradatim attenuatis teneris interdum margine obsolete denticulatis saepe integerrimis, 3—5(7) cm longis, 0.5—0.7 mm latis; scapis gracilibus interdum fere filiformibus, 10—17(35) cm longis, 0.5—1.5 mm crassis, post anthesin valde elongatis in umbellam pauciradiatam abeuntibus; umbellae radiis inaequalibus, 1—2(3) cm longis, filiformibus involucrum duplo triplove superantibus apice minutissime nigro punctulatis; phyllis oblongo-lanceolatis, 3—5(6) mm longis, acuminatis basi auriculatis virescentibus. Calyx tubulosus cylindraceus fere usque ad tertiam partem in denticulos subtrigonos declinatos partitus, intense nigro glanduloso punctulatus. Corollae tubus calyce duplo longior in limbum parvum [3—4(5) mm in diam.] auctus, lobis obcordatis bipartitis. Capsula oblonga fusca calycem superans, dentibus rectis maturitate dehiscentibus coronata. V—VI.

A *P. sibirica* Jacq. floribus minoribus, foliis angustioribus spathulatis, scapis gracilibus; a *P. pamirica* Fed. praeter notas indicatas rosulis laxiusculis, foliis tenerioribus, umbellis pauciradiatis distinguenda. Inter omnes species seriei *Sibiricae* Fed. floribus parvulis insignis.

Typus: Seravschania, lacus Iskander-Kul, alt. ca. 2500 m s. m., in regione juniperina. 1893 V 18, V. L. Komarov.

Area geographica: Tadzhikistania omnis. Orientem versus ab jugo Turkestanico distributa.

10. *P. Knorringiana* Fed. sp. n.

Glaberrima, foliis omnibus rosularibus oblongo-obovatis vel fere spathulatis apice obtusis in petiolum gracilem limbum subaequantem vel eo brevioris sensim (nec subito) angustatis teneribus ad marginem conspicue sinuato denticulatis vel integerrimis laxis, 5—8(10) cm longis, 0.7—1.5(2) cm latis; scapis longissimis incrassatis et interdum robustis, 20—40(50) cm longis, 1.5—2(3) mm crassis in umbellam saepe duam superpositam abeuntibus; umbellae radiis strictis valde inaequalibus, 2—3(3.5) cm longis, involucri multiplo longioribus; phyllis oblongo-lanceolatis subulatis, 4—5(7) mm longis, basi manifesto auriculatis viridibus. Flores parvuli albi fauce aurantiaci. Calyx tubulosus urceolato cylindraceus fere ad tertiam partem in lobos acutos subulatos recurvos partitus viridis. Corollae tubus calyce sesqui longior in limbum parvum (0.5—0.7 in diam.) auctus, lobis obcordatis profunde bipartitis. Capsula oblonga fusca calycem subsuperans, dentibus maturitate dehiscentibus terminata. VII.

Parum affinis *P. Iljinskii* m. sed ab ea habitu robusto, scapis longissimis crassioribus, foliis in omnibus partibus majoribus, floribus albis fauce aurantiacis dignoscenda. Inter omnes species seriei *Sibiricae* m. scapis longissimis et floribus albo-aurantiaceis prominens.

Typus: Asia media, Tjan-Schanj centralis. In montibus Terskey-Alatau, ad flum. Tekes. 14 VII 1950, n° 450, leg. O. Knorring.

Area geographica: Tjan-Schanj centralis. Verisimiliter endemica species.

Nomen speciei descriptae dedimus in honorem cl. O. E. Knorring, Florae Asiae mediae exploratoris.

11. *P. xanthobasis* Fed. sp. n.

Planta crassiuscula glabra vel vix glandulosa glaucescens basi dense sulphureo farinosa ad collum reliquis flavo fuscis membranaceis nitentibus foliorum emarcidorum donata, foliis omnibus rosularibus crebris late lanceolatis acutis in petiolum alatum sensim attenuatis, 5—7(10) cm longis, 1.5—2(2.5) cm latis, integerrimis vel minutissime et obsolete serrulatis margine convolutis basi et interdum ad paginas inferiores sulphureo farinosis; nervo mediano robusto utrinque prominulo; scapis 10—15(20) cm longis, crassiusculis folia duplo superantibus sub apice atrovioleaceis. Umbella multiflora compacta vel rarius oligantha, involucri phyllis angustatis, 0.7—1 cm longis, e basi triangulari lanceolato-linearibus apice obtusiusculis atroviridibus pedicellis vix longioribus vel subbrevioribus. Calycis tubus cylindricus ca. 0.7 cm longus in denticulos lanceolatos acutiusculos usque ad medium et ultra partitus extus nigricans vel interdum atroviola-ceus intus sulphureo farinosus. Corolla magna calycem vix superans purpureo violacea (in sicco), tubo apice dilatato in limbum planiusculum ca. 2 cm in diametro, subito ampliato, lobis oblongatis apice rotundatis integerrimis. VI.

Inter omnes species sectionis *Crystallophlomidis* Rupr. farina sulphurea densa ad collum radices collocanda insignis. Plus minus affinis *Primulae purpureae* Royle (ex Himalaja).

Habitat verisimiliter in regione alpina ad nives tabescentes.

Typus: Jugum Tannu-Ola. In valle fluminis Balykty-Chem. 50°20' lat. boreal., 96°50' longit. orient. Ad trajectum ca. 2260 m s. m. 5 VI 1946, K. A. Sobolevskaja et O. Stennikova.

Cotypus: Ibidem, in valle Naryn, prope pagum Naryn. 50°10' lat. boreal., 96°30' longit. orient. 4 VI 1946, K. A. Sobolevskaja et A. Sergeeva.

Area geographica: montes Tannu-Ola orientales ad limites Mongoliae et in montibus cis et transbaicalensibus (Munku-Sardyk, Czokondo) usque ad peninsulas Czukotka et Kamczatka.

12. *P. pulverea* Fed. sp. n.

Fere tota farina alba obsita, rhizomate crasso brevi ad apicem residuis numerosis densis nigrescentibus foliorum vetustorum donato, foliis rosulam laxam diffusam formantibus oblongo-lanceolatis in petiolum subduplo brevioribus, 10—15(18) cm longis, 1.5—2 cm latis irregulariter crenato denticulatis obtusis vel acutiusculis subtus margineque

728 albo farinosis supra farina destitutis, scapis folia superantibus glabris. Umbella oligantha, involucris phyllis lineari lanceolatis, 4—5 mm longis, pedicelli albofarinosi dimidium aequantibus. Calyx campanulatus albo farinosus; ca. 6 cm longus in denticulos triangulari lanceolatos acutos usque ad medium partitus. Corollae tubus calyce duplo longior in limbum planum auctus, lobis obovatis integris pallide roseis.

Ob calyces pedicellosque dense albo farinosos inter omnes species sectionis *Crystallophlomidis* prominens.

Habitat in glareosis juxta nives aeternas in montibus.

Typus: Pamiria, in valle fluminis Kok-Bai, 3960 m s. m. 29 VIII 1932, n° 848, N. Gorbunov.

Area geographica: Pamiria.

DIONYSIA Fenzl

13. Sect. 1. **Bryonanthe** Smoljan. sect. n. — Flores solitarii subsessiles pedicellis brevissimis, 1—2 mm long., bracteis parvis lanceolatis vel linearibus integerrimis. Ovula in numero 2—6, semina minuta; 0.75—1.5 mm longa. Folia integerrima crassa paulo aromatica. Plantae pulvinos densos formantes.

Species octo in Irania, Affghania et in Asia media crescentes. A ceteris sectionibus generis foliis integerrimis forma bractearum et habitu proprio distinctae.

14. Sect. 2. **Dionysiopsis** (Pax) Smoljan. sect. n. — Generis *Primulae* sect. *Dionystopsis* Pax in Schl. Gesellsch. für vaterl. Kultur, 87. Jahrb. II (1909) 19. — Flores pedicellati citrini; 2—3 in umbellas dispositi, scapis nutantibus; bracteis 2—3, foliis similibus utroque latere ad marginem 3—5 dentatis; corollae tubo calyce duplo longiore, lobis limbi liguliformibus integris; ovulis 20—30; seminibus parvis fere orbicularibus vel late ovatis; foliis spathulato oblongis teneris basin versus sensim angustatis marginibus utroque latere 4—5 dentatis, rosulam formantibus.

Sectio monotypica in Asia media distributa. Ab omnibus sectionibus generis *Dionysiae* floribus umbellatis, pedunculatis, scapis nutantibus, bractearum forma et habitu distincta. — Sectionis typus: *D. hissarica* Lipsky.

15. Sect. 3. **Dionysiastrum** Smoljan. sect. n. — Flores sessiles pallide lilacini, 2—5 in umbellos dispositi; scapis erectis; bracteis involucratissimis 2—5, folia superantibus, fere orbicularibus margine inaequaliter dentatis, dentibus majusculis; corollae tubo calyce 3—3½-plo longiore, lobis limbi obovatis margine sinuatis, ovulis 6—16, seminibus ovalibus vel oblongo ovatis aut ovatis, parvis, 1.75—2 mm longis; foliis crebris late spathulatis vel obovatis apice crenibus 3—5 parvulis instructis, odoratis.

Sectio monotypica in Asia media distributa. Ab omnibus sectionibus generis *Dionysiae* forma bractearum bene differt. — Sectionis typus: *D. involucrata* Zapr.

16. *A. sericea* Ovcz. sp. n. (subsect. *Villosae* Hand.-Mztt.).

Caespitosa albo-cinerea; folia rosularum fertile linearilanceolata acuminata aequilonga basi angustata, 3—6 mm lg., 0.8—1.4 mm lt. margine et utrinque, praesertim subtus, a basi pilis longis sericeis tecta, supra interdum subglabra; folia ramulorum sterile breviora non plurima. Scapi solitarii, 4—5 cm lg. tenues pallide virides, 2—3(4)-flori, pilis squarrosis mixtis paulo tecti; bractee 5—7 mm lg. late-lanceolatae vel ellipticae, pilis longis sericeis patentibus dense tectae; pedicelli inaequilongi; calyx sublanatim longeque pilosus, usque ad medium fissus, dentibus lanceolatis acuminatis; corolla 7—8 mm diam. alba, fauce ochroleuca, lobis rotundatis saepe paulo crenulatis.

Habitat in subalpinis montium Tjan-Schanj et Pamiro-Alaj.

Typus: Asia media, prov. Leninabad, prope lacum Ajna-Kul, 17 VI 1914, leg. O. Knorring; in Inst. Bot. nom. V. Komarovii Ac. Sc. URSS conservatur.

A caeteris speciebus subsect. *Villosae* pubescentia densa atque foliis brevioribus (3—6 mm lg.) distinguitur.

17. *A. Ovczinnikovii* Schischk. et Bobr. sp. n. (subsect. *Villosae* Hand.-Mztt.).

Laxe caespitosa, argenteo-viridis, 5—6(7) cm alt.; folia inaequilonga, in rosulis fertilibus elongato-linearibus vel linearilanceolata, basi angustata, apice rotundata vel obtusa, margine pilis longis paulo articulatis patentibus ac minutissimis capitulatis tecta, supra interdum glabra, 1—1.8 (2.2) mm lt., exteriora 3—6 mm lg., interiora 7—12 mm lg.; folia ramulorum sterile lanceolata 4—7 mm lg., 2—2.5 mm lt., apice obtusata vix acuta, margine ac subtus in parte superiore pilosa. Scapi 3.5—4.5 cm longi, tenues 3—7-flori pilis albis longis patentibus ac plurimis capitulatis tecti; inflorescentia compacta, bractee lanceolato-ellipticae, 4—6 mm lg., 2—2.5 mm lt. aequae pubescentes, basi auriculatae; pedicelli ca. 2 mm lg. dense pilosi; calyx 3—3.5 mm lg. late campanulatus dense sericeo-pilosus ad medium fissus, dentibus elongato-lanceolatis, plus-minus rotundatis corollae tubo subaequalibus; corolla alba, tardius rosea, 8—9 mm diam. lobis obovatis integerrimis vel vix emarginatis.

Habitat in regione stepposa montium altaicis, Kasakhstaniae orientalis ac Mongoliae adjacentis, in declivibus shistosis et in humidis salsuginosis.

Typus: Altai, fl. Tscharysch, in pratis salsis 27 VI 1931, leg. B. Schischkin; in Inst. Bot. nom. V. Komarovii Ac. Sc. URSS conservatur.

A caeteris *Villosarum* caespitibus laxis viridibus, pubescentia sparsiore atque areis habitationeque differt.

18. *A. barbulata* Ovcz. sp. n. (subsect. *Villosae* Hand.-Mztt.).

Caespitosa sericeo ac cinerascens-pilosa, raro subglabra (var. *glabrata*); folia in rosulis fertilibus lanceolata 6—8 mm lg., 0.5—1 mm lg.,

730 *basi angustata*, utrinque, subtus tamen dense longeque, pilosa; folia ramulorum sterilium lineari elongata vel lanceolata. Scapi breves vel ad 3—6 cm lg., (2) 3—5-flori pilis longis flexilibus floccose tecti; bracteae ovato-lanceolatae, dense, interdum sublanuginoso pilosae; calyx lanuginoso denseque pilosus, usque ad medium vel paulo minus fissus, dentibus elongato-lanceolatis dense pilosis; flores 8—11 mm diam. albescentes vel roseo-purpurei, lobis obovatis apice truncatis.

Habitat in subalpinis et alpinis Caucasi.

Typus: Caucasus, Ossetia, prope pagum Big, 16 V 1897, leg. Marcovitsch; in Inst. Bot. nom. V. Komarovii Ac. Sc. URSS conservatur.

Haec species ab *A. sericea* Ovcz. foliis longioribus areisque a caeteris *Villosarum* pubescentia densa caespitibus non laxis dignoscit.

19. **A. taurica** Ovcz. sp. n. (subsect. *Villosae* Hand.-Mztt.). — *A. villosa* auct. Fl. taur. non L.

Perennis; tota planta sericeo-viridula, caespites laxiusculos formans; folia rosularia externa 3—4 mm longa, lanceolata vel oblongo-lanceolata, acutiuscula, subtus pilis dispersis tecta, marginibus et apice pilis minimis capitatis munita; folia interna 9—12 mm longa, lineari-ligulata, basi sensim angustata, apice acuminata, marginibus et apice sericeo-pilosa; folia externa rosularum sterilium lineari-lanceolata vel linearia, acuminata, 7—14 mm longa, 0.5—1.4 mm lata, subtus in tota superficie appressim pilosa, apice penicillata; stolones hornotini rubescentes pilis dispersis appressis tecti, 2.5—3 cm longi. Scapi 5—8 cm longi longe subpatentim pilosi, 2—4-flori, bracteae lanceolato-ellipticae, acutiusculae, appressim pilosae, 5—6 mm longae et 1.5(2) mm latae, pedicellis breviores; pedicelli 8—10 mm longi appressim hirsuti; calyx usque ad dimidium fissus appressim pilosus dentibus lanceolatis; limbus corollae ad 7 mm in diametro, in fauce vallicula prominula munitus.

Habitat in fagetis collucatis, clivibus stepposis et rupestribus.

Typus: Tauria, mons Schischko, in lapidosis. Fl. 18 VI 1898, leg. Golde; in herb Inst. Bot. nom. V. Komarovii As. Sc. URSS conservatur.

Nostra species affinis est *A. incanae* Lam., sed pubescentia argentea deficiente et pedicellis bracteis vix longioribus diversa est.

20. **A. Koso-Poljanskii** Ovcz. sp. n. (subsect. *Villosae* Hand.-Mztt.).

Valde affinis *A. tauricae* Ovcz. sed differt rosulis dentioribus multifoliosis, foliis obtusiusculis rigidioribusque, minus pilosis, vena media subtus prominula, scapis sublanuginosis pilis longis albidis subcernuis vestitis (nec pilis patentibus nitentibusque), folia rosularum externa fere oblongo-lanceolata, 5—6 mm longa et 2 mm lata, interna linearia basi angustata, 14—17 mm longa et 2 mm lata, omnia marginibus atque subtus et apicibus pilis sericeo-albis vestita, marginibus insuper pilis capitatis mollibus instructa, scapis 1—7-floris, 3—9 cm altis.

Habitat in clivis cretaceis stepposisque.

Typus: prov. Voronezh, Korotojak, in cretaceis. Fl. 9 V 1905, Schingarev; in Herb. Inst. Bot. nom. V. Komarovii Ac. Sc. URSS conservatur.

21. *A. angrenica* Ovcz. sp. n. (subsect. *Dasyphyllae* Ovcz.).

Perennis; planta griseo-viridis, pubescens demum subglaber, caespites laxiusculos formans, stolonibus numerosis ramosis diffusis, stolones juveniles tenues, subglabri, pallide purpurei; rosulis parvis terminantibus; folia parva, griseo-viridia, crassiuscula, spatulato-lanceolata, subtus vena prominula munita et breviter pilosa, supra glaberrima. Scapi breves 1—1.5 cm longi, pilis longiusculis flexuosis tecti 1—3-flori; bracteae lanceolatae, pedicellis longiores, pilosae; calyx usque ad dimidium vel profundius quinquesectus, dentibus oblongo-lanceolatis, obtusiusculis, appressim pubescentibus; corollae lobis oblongo-lanceolatis, apice emarginatis vel denticulatis.

Typus: Tjan-Schanj occidentalis. Montes Angren prope thermulas Arassan, alt. ca. 3000 m, 7 VII 1914, Z. Minqitz; in Herb. Inst. Bot. nom. V. Komarovii Ac. Sc. URSS conservatur.

A. angrenica Ovcz. valde affinis *A. dasyphyllae* Bge. et *A. acrolasiae* Ovcz. et Vved., sed ab ambobus caespitibus laxiusculis et foliis oblongo-linearibus usque ad 6 mm longis, nec cymbiformibus, 2—4 mm longis differt.

CORTUSA L.

22. *C. amurensis* Fed. sp. n.

Planta alta glabriuscula (sub oculo armato parce pilosa), rhizomate videtur obliquo radicibus atro fuscis fibrosis donato, foliis omnibus radicalibus magnis, 8—10 cm longis, 7—9 cm latis, teneris, ambitu orbiculari-reniformibus, obtuse lobato dentatis, lobis rotundatis, dentibus rotundato triangularibus, pilis brevissimis praecipue ad paginas inferiores sparse obsitis, in petiolum longum anguste alatum laminam eorum duplo triplove superantem e basi cordata abrupte angustatis. Scapi folia sesqui superantes, parce minute pilosi crassiusculi, apice in umbellam multiradiatam abeuntes, floribus numerosis violaceis mediocribus. Involucri phylla oblongo-deltaidea apice inciso dentata, pedicellis gracilibus filiformibus inaequalibus minutissime glandulosis. Calyx campanulatus ad medium in denticulos acutos anguste lanceolatos partitus, minutissime glanduloso pilosus. Corolla infundibuliformis, 0.7—1 cm longa, lobis obovatis, calycem plus minus superans. Capsula straminea ovata calyci aequilonga. VI.

Certe affinis *C. turkestanicae* A. Los., differt praecipue area geographica, floribus minoribus atque foliorum dentibus.

Habitat ad rivulos in regione silvatica montium.

Typus: regio amurensis. In jugo Tukuringra ad flumen Zeja. Ad fontes rivi, in lapidibus muscosis, 1 VI 1914; n° 179, leg. N. Prokhorov et O. Kuseneva.

Area geographica: Oriens Extremus, in montibus ad flumen Amur. Species endemica videtur.

23. Tribus **Glauceae** Fed. trib. n. — Capsula globosa fere rostrata valvulis dehiscens. Calyx corollaeformis coloratus, corolla autem nulla. Flores axillares, subsolitarii, subsessiles. Caules ramosi foliosi, foliis carnosulis.

Typus tribus: *Glaux* L. — genus monotypicum.

ACANTHOLIMON Boiss.

24. **A. Zaprjagaevii** Lincz. sp. n. (Sect. *Glumaria* Boiss.).

Fruticulus dense depresso-pulvinatus, ramis brevibus, densissime foliosis; folia glauca vel glaucescenti-viridia, plana, lanceolata vel late lanceolata, rigida, 5—8 (15) mm longa et (1.5) 2—2.5 mm lata, in parte superiore plus minusve sensim angustata, apice acerosa, glabra vel vix puberula, margine minute ciliato-scabra. Scapi folia parum superantes, ad 1.5 cm alti, simplices, breviter denseque pubescentes; spicae ca. 1 cm longae, dense 3—5-spiculatae, subcapitatae; spiculae 2—3-florae, bracteis glabris vel parce puberulis; bractea exterior ca. 5 mm longa, interioribus conspicue brevior, sed calycis tubum subaequans, irregulariter late ovata (subrhomboidea), angustiuscule membranaceo-marginata, apice acuminato-mucronata; bractee interiores calycis tubum conspicue superantes, latissime membranaceo-marginatae vel praeter nervum medium angustum fere omnino membranaceae, apice breviter mucronatae; calyx ca. 8 mm longus; tubus eius ca. 4 mm longus, inter nervos parce inaequaliterque pilosulus; limbus albus, basi pallide roseus, ca. 4 mm latus, plus minusve distincte 10-lobus vel subtruncatus, nervis ante marginem evanidis, purpureis, in parte inferiore extus plus minusve dense pilosulis vel glabris; petala intense rosea.

Habitat. Montes Pamiro-Alaj Asiae Mediae, in rupestribus regionis alpinae.

Typus. Asia Media. Tadzhikestania austro-orientalis, distr. Daschtydzhum, declivia occidentalia montis Kuhi-frusch, in rupibus, 3350 m s. m., 11 IX 1935, n° 1391, leg. I. Linczevski; in Herb. Inst. bot. nom. V. Komarovii Ac. Sc. URSS (Leninopoli) conservatur.

Affinitas. *A. lycopodioidi* (Girard) Boiss. affine est, sed foliis duplo brevioribus, scapis subnullis etc. statim dignoscitur.

Nomen in memoriam cl. beati Th. L. Zaprjagaev (1903—1942), florum Tadzhikestaniae exploratoris, dedico.

25. **A. alaicum** Czerniak. sp. n. (Sect. *Glumaria* Boiss.).

Fruticulus dense subhemisphaerico- vel hemisphaerico-pulvinatus, ramis brevibus densissime foliosis; folia glauca vel glaucescenti-viridia, plana vel vix triquetra, linearia, rigidiuscula, (5) 8—10 (15) mm longa et ca. 1.5 mm lata, apice rotundato-obtusata vel acutiuscula, mucronibus subnullis vel sat distinctis, glabra, basi tantum margine minute ciliato-

733 *scabra*. Scapi elongati, folia longe superantes, ad 4—5 cm alti, simplices, breviter denseque pubescentes; spicae ca. 1—1.5 cm longae, densiuscule 4—7-spiculatae, subdistincte distichae vel unilaterales; spiculae (1) 2—3-florae, bracteis glabris; bractea exterior ca. 3 mm longa, interioribus et calycis tubo duplo brevior, irregulariter late rhomboidea, latiuscule membranaceo-marginata, apice breviter acuminato-mucronata; bractee interiores calycis tubum paulo superantes, latissime membranaceo-marginatae vel praeter nervum medium angustum fere omnino membranaceae, apice brevissime mucronatae vel muticae; calyx ca. 7—8 mm longus; tubus eius ca. 4—5 mm longus, totus (nec inter nervos tantum) dense pilosulus; limbus albus, ca. 3 mm latus, obsolete 10-lobus vel subtruncatus, nervis ante marginem evanidis, in parte inferiore extus dense pilosulis; petala rosea.

Habitat. Montes Pamiro-Alaj Asiae Mediae, in valle Alaj.

Typus. Asia Media. Kirghizia australis, prov. Dzhahalabad; in valle Alaj ad fl. Dora, 24 VI 1913, n° 1097, leg. G. Dolenko; in Herb. Inst. bot. nom. V. Komarovii Ac. Sc. URSS (Leninopoli) conservatur.

Affinitas. Species, ut videtur, ex affinitate *A. Borodinii* Krassn., foliis subinermibus (nec acerosis), scapis elongatis folia longe superantibus, bracteis exterioribus calycis tubo duplo brevioribus (nec eum subaequantibus) etc. bene differt.

26. *A. Mikeschinskii* Lincz. sp. n. (Sect. *Glumaria* Boiss.).

Fruticulus densiuscule subhemisphaerico-pulvinatus; folia glauca vel glaucescenti-viridia, plana, anguste lineari-lanceolata vel linearia, rigida, (1) 1.5—2.5 (3) cm longa et 1—1.5 (2) mm lata, in parte superiore sensim angustata, apice acerosa, glabra, margine minute ciliato-scabra. Scapi elongati, folia longe superantes, 8—15 cm alti, simplices, breviter et densiuscule pubescentes; spicae 6—10 cm longae, laxissime 4—8-spiculatae, spiculis distantibus, intervallis longitudinem earum subaequantibus; spiculae 2—3-florae, bracteis glabris; bractea exterior 7—10 mm longa, interioribus conspicue brevior, sed calycis tubum plerumque aequans, irregulariter oblongo-ovata, in parte superiore sensim angustata, apice longiuscule cuspidata; bractee interiores exteriorem et calycis tubum plerumque conspicue superantes, limbo calycino dimidio attingentes vel etiam eo superantes, latissime membranaceo-marginatae vel praeter nervum medium angustum, dorso conspicue carinatum (sed non carinato-alatum), fere omnino membranaceae, apice, interdum e dorso mucronatae; calyx ca. 10 mm longus; tubus eius ca. 6—7 mm longus, inter nervos plus minusve dense pilosulus; limbus roseus, ca. 3 mm latus, obsolete 10-lobus, nervis purpureis, glabris, ad marginem usque productis; petala rosea.

Habitat. Montes Tian-Schan occidentalis Asiae Mediae, in declivibus saxosis, ca. 1000 m s. m.

Typus. Asia Media. Kazachstaniana australis; jugum Karatau, loco Akczektau in vicinia pag. Michailovka, 1100 m s. m., 27 VI 1937, leg. G. Mikeschin; in Herb. Inst. bot. nom. V. Komarovii Ac. Sc. URSS (Leninopoli) conservatur.

Affinitas. Species ex affinitate *A. compacti* Korov., pulvinis minus densioribus, foliis longioribus, bracteis interioribus longioribus, calycis tubum vel etiam calycem totum superantibus, dorso carinatis (nec carinato-alatis), glabris sat differt.

27. *A. strictum* Czerniak. sp. n. (Sect. *Glumaria* Boiss.).

Fruticulus laxiuscule subhemisphaerico-pulvinatus; folia virescenti-glauca, plano-triquetro-subulata, stricta, rigida, 2—3.5 (4) cm longa et ca. 1 mm lata, apice acerosa, glabra, margine minutissime ciliato-scabra vel laevia. Scapi elongati, folia multo superantes, ad 15—30 cm alti, simplices vel vix ramosi, glabri, laeves, rarius brevissime pubescentes; spicae 5—12 cm longae, laxissime (3) 5—7-spiculatae, spiculis distantibus, intervallis longitudinem earum 2—3-plo superantibus; spiculae 2—3-florae, bracteis glabris vel, rarius, brevissime puberulis; bractea exterior ca. 8—9 mm longa, interioribus conspicue brevior et calycis tubum subaequans, subovata vel oblongo-ovata, angustiuscule membranaceo-marginata, in parte superiore sensim angustata, apice mucronata; bractee interiores calycis tubum multo superantes, limbum calycinum dimidium attingentes, late membranaceo-marginatae vel praeter nervum medium angustum fere omnino membranaceae, apice, plerumque e dorso breviter mucronatae; calyx ca. 11—12 mm longus; tubus eius 7—8 mm longus, inter nervos sat dense et longe pilosulus; limbus roseus, ca. 3—4 mm latus, plus minusve distincte 10-lobus vel subtruncatus, nervis purpureis, glabris vel in parte inferiore extus sparse pilosulis, supra marginem paulo excurrentibus; petala intense rosea.

Habitat. Montes Kopetdagh Turcomaniae, in decliviis saxosis, siccis, in Artemisietis frequens, 1000—1500 m s. m.

Typus. Asia Media. Turcomania, prov. Aschchabad; inter pag. Firjuza et Czaek, 16 VI 1924, n° 255, leg. E. Czerniakovska; ibid., in montibus inter pag. Czuli et Cheirabad, 26 VI 1898, n° 1945, leg. D. Litvinov (paratypi); in Herb. Inst. bot. nom. V. Komarovii Ac. Sc. URSS (Leninopoli) conservatur.

Affinitas. Species ex affinitate *A. bromifolii* Boiss. et *A. scirpini* Bge.; a primo foliis multo angustioribus, subulatis et spicis paucifloris, a secundo foliis multo longioribus, bracteis exterioribus longioribus, limbo calycino roseo (nec albo) recedit.

28. *A. pskemense* Lincz. sp. n. (Sect. *Glumaria* Boiss.).

Fruticulus laxo subdepresso-pulvinatus, ramis elongatis, ad 20 cm longis, procumbenti-adscendentibus; folia aestivalia virescenti-glauca, plana,

735 linearilanceolata, rigida, 2—3 cm longa et ca. 2 mm lata, in parte superiore sensim acutata, apice breviter mucronata, basi subtus brevissime et sparse puberula, ceterum glabra, margine minute ciliato-scabra; folia vernalia paulo breviora, ceterum similia. Scapi elongati, folia longe superantes, ad 15—20 cm alti, in parte dimidio superiore sat longe 1—2-ramosi vel simplici, sat dense et brevissime pubescentes; spicae laxissime 10—12-spiculatae, spiculis distantibus, intervallis longitudinem earum aequantibus vel eo duplo brevioribus; spiculae inferiores biflorae, ceterae uniflorae; bractea exterior subglabra, ca. 5 mm longa, interioribus ca. 1.5-plo brevior, oblongo ovata, angustiuscule membranaceo-marginata, in parte superiore sensim acuminata, apice breviter mucronata; bractee interiores brevissime denseque puberulae, calycis tubo paulo breviores vel eum subaequant, latissime membranaceo-marginatae, in parte superiore sensim acuminatae, breviter mucronatae vel muticae; calyx ca. 12 mm longus; tubus eius ca. 6—7 mm longus, inter nervos brevissime sparseque pilosulus; limbus roseus, ca. 5—6 mm latus, distincte 10-lobus, nervis in parte inferiore pilosulis, ad marginem usque productis; petala rosea.

Habitat. Montes Tian-Schan occidentalis Asiae Mediae, in declivis saxosis regionis arboreto-dumosae.

Typus. Asia Media. Kazachstanica australis; jugum Pskemense, in rupibus supra pag. Pskem, 8 VIII 1936, leg. A. Dmitrieva; in Herb. Inst. bot. nom. V. Komarovii Ac. Sc. URSS (Leninopoli) conservatur.

Affinitas. *A. Ekatherinae* (B. Fedtsch.) Czerniak. peraffine, videtur, est, sed spiculis inferioribus bifloris (nec omnibus unifloris) atque scapis elongatis, non rare longe ramosis, foliis longioribus angustioribusque, bracteis puberulis eximie differt.

29. *A. Margaritae* Korov. sp. n. (Sect. *Staticopsis* Boiss.).

Fruticulus laxissime subhemisphaerico-pulvinatus, ramis elongatis, procumbenti-adscendentibus, laxe foliosis; folia aestivalia viridia, planotriquetra vel subplana, linearisubulata, rigida, (1.5) 2—3.5 cm longa et ca. 1 mm lata, apice acerosa, glabra, margine minutissime ciliato-scabra vel laevia; folia vernalia conspicue breviora et vix latiora, ceterum similia. Scapi elongati, folia longe superantes, ad 12—15 cm alti, in dimidio superiore sat longe ramosi, glabri; spicae laxissimae, spiculis distantibus, intervallis longitudinem earum plus minusve aequantibus; spiculae uniflorae, bracteis glabris; bractea exterior ca. 2—3 mm longa, interioribus ca. 2—3-plo brevior, ovata, anguste membranaceo-marginata, in parte superiore obtusato-acuminata, apice mutica vel breviter mucronata; bractee interiores calycis tubo ca. 1.5-plo breviores, late membranaceo-marginatae, apice late rotundatae vel subtruncatae, breviter mucronatae vel muticae; calyx ca. 12—13 mm longus; tubus eius ca. 7—8 mm longus, inter nervos parcesissime pilosulus (subglaber); limbus purpureus, ca. 5 mm latus, plus.

736 minusve distincte 10-lobus, nervis glabris, vix supra marginem excurrentibus; petala rosea.

Habitat. Montes Tian-Schan occidentalis Asiae Mediae, in rupestribus.

Typus. Asia Media. Uzbekistania, prov. Taschkent; systema fl. Angren, in angustiis Koschsaj, in rupibus, in Juniperetis, 31 VII 1924, n° 18, leg. M. Sovetkina; in Herb. Universitatis As. Med. (Taschkent) conservatur.

Affinitas. Species, ut videtur, ex affinitate *A. aulieatensis* Czerniak., pulvinis amplis laxisque, foliis multo longioribus, bracteis interioribus brevioribus, calycibus amplioribus bene differt.

30. *A. nuratavicum* Zakirov sp. n. (Sect. *Staticopsts* Boiss.).

Fruticulus dense subhemisphaerico-pulvinatus, ramis brevibus, dense foliosis; folia aestivalia virescenti-glauca, plano-triquetra vel subplana, anguste lineari-lanceolata vel subsubulata, rigida, 0.5—1 (1.5) cm longa et ca. 0.5—1 mm lata, apice acerosa, dense et brevissime puberula, margine minute ciliato-scabra; folia vernalia paulo breviora et latiora, ceterum similia. Scapi elongati, folia longe superantes, 10—15 cm alti, simplices, basi brevissime pubescentes, ceterum glabri; spicae laxissimae, spiculis distantibus, intervallis longitudinem earum aequantibus vel subduplo superantibus; spiculae uniflorae, bracteis glabris; bractea exterior ca. 3—4 mm longa, interioribus subduplo brevior, plus minusve oblongo-ovata, anguste membranaceo-marginata, in parte superiore plus minusve sensim acuminata, apice mucronata; bractee interiores calycis tubo paulo breviores, late membranaceo-marginatae, apice obtusato-rotundatae vel subtruncatae, breviter mucronatae vel muticae; calyx ca. 10 mm longus; tubus eius ca. 6 mm longus, inter nervos sat dense pilosulus; limbus roseus vel purpureus, ca. 4 mm latus, distincte 10-lobus, nervis glabris, ad marginem evanidis; petala rosea.

Habitat. Montes Pamiro-Alaj septentrionali-occidentalis exterior, in decliviis saxosis.

Typus. Asia Media. Uzbekistania, prov. Samarkand; montes Nuratau, in planitie elevata Sintabensi, 31 VII 1928, n° 1353, leg. Jakimova et Moskvina; in Herb. Universitatis As. Med. (Taschkent) conservatur.

Affinitas. Species ex affinitate *A. minshelkensis* Pavl., sed foliis paulo brevioribus, puberulis (nec glabris), scapis simplicibus, calycibus paulo amplioribus, limbo latiore distincta est.

31. *A. hissaricum* Lincz. sp. n. (Sect. *Staticopsts* Boiss.).

Fruticulus densiuscule subhemisphaerico-pulvinatus, ramis brevibus, sat dense foliosis; folia aestivalia viridula vel glaucescenti-viridia, plano-triquetra vel subplana, anguste lineari-lanceolata vel subsubulata, rigida, (0.5) 1—1.5 cm longa et ca. 1 mm lata, apice acerosa, glabra, margine

737 (interdum basi tantum) minute ciliato-scabra; folia vernalia conspicue breviora et latiora (ad 2 mm lata), ceterum similia. Scapi elongati, folia longe superantes, 5—10 cm longi, in dimidio superiore breviter ramosi vel simplices, glabri; spicae laxissimae, spiculis in axibus centralibus distantibus, intervallis longitudinem earum aequantibus vel paulo brevioribus, in ramis lateralibus paulo approximatis; spiculae uniflorae, bracteis glabris; bractea exterior ca. 4—5 mm longa, interioribus subduplo brevior, plus minusve oblongo-ovata, angustiuscule membranaceo-marginata, in parte superiore plus minusve sensim angustata, apice mucronata; bractee interiores calycis tubum plus minusve aequantes, latiuscule membranaceo-marginatae, apice obtusato-acuminatae vel rotundatae, mucronatae; calyx ca. 12—13 mm longus; tubus eius ca. 7 mm longus, inter nervos breviter sparseque pilosulus; limbus roseus vel purpureus, plus minusve distincte 10-lobus, nervis glabris, ad marginem usque productis; petala rosea.

Habitat. Montes Pamiro-Alaj, in decliviis saxosis parti occidentali jugi Hissarici.

Typus. Asia Media. Uzbekistania, prov. Kaschka-darja; jugum Hissaricum, in planitie elevata Czekmen-kuidy prope pag. Tasch-kurgan, declivia australia, 2500—2600 m s. m., 14 VIII 1951, n° 43, leg. Kabulov; in Herb. Inst. bot. nom. V. Komarovii Ac. Sc. URSS (Leninopoli) conservatur.

Affinitas. Species ex affinitate *A. Gontscharovii* Czerniak., sed foliis, scapis bracteisque glabris (nec puberulis) bene differt.

32. *A. virens* Czerniak. sp. n. (Sect. *Staticopsis* Boiss.).

Fruticulus laxissime subdepresso-pulvinatus, ramis elongatis, procumbentibus, laxe foliosis; folia aestivalia plus minusve virentia, plana, linearilanceolata vel linearia, rigida, (0.5) 1—1.5 (2) cm longa et (1) 1.5—2 mm lata, apice acerosa, plus minusve dense et breviter puberula (rarius—var. *glabrum* Lincz.—glabra), margine minutissime ciliato-scabra vel laevia; folia vernalia paulo breviora et vix latiora, ceterum similia. Scapi folia parum superantes vel non superantes, 1.5 (et tum spicae in axillis foliorum subsessiles)—5 cm alti, simplici, breviter et plus minusve dense pubescentes vel (var. *glabrum*) glabri; spicae ca. 1.5—2 cm longae, densiuscule 3—5 (7)-spiculatae, plus minusve distincte distichae; spiculae uniflorae, bracteis breviter et plus minusve dense puberulis vel (var. *glabrum*) glabris; bractea exterior ca. 4—6 mm longa, interioribus ca. 1.5 (2)-plo brevior, oblongo ovata, latiuscule membranaceo-marginata, in parte superiore plus minusve sensim acutata, apice cuspidata; bractee interiores calycis tubum aequantes vel eum paulo superantes, latissime membranaceo-marginatae (sub omnino membranaceae), apice rotundatae vel plus minusve obtusato-acuminatae, muticae vel breviter mucronatae; calyx ca. 11—13 mm longus; tubus eius ca. 7—8 mm longus, inter ner-

738 vos sparse pilosulus; limbus roseus vel purpureus (interdum albus?), ca. 4—5 mm latus, plus minusve distincte 10-lobus, nervis glabris vel in parte inferiore extus pilosulis, ante marginem evanidis, vel ad marginem usque (rarius vix ultra) productis; petala rosea.

Habitat. Montes Pamiro-Alaj interior, in decliviis saxosis regionis subalpinae.

Typus. Asia Media. Tadzhikistania, prov. Garm; systema fl. Chingou, in descensu a trajecto Rujurt ad fl. Parcza-choschak, in decliviis rubro-arenosis, 2650 m s. m., 22 VII 1932, n° 758, leg. N. Gontscharov, G. Grigorjev et V. Nikitin; in Herb. Inst. bot. nom. V. Komarovii Ac. Sc. URSS (Leninopoli) conservatur.

Affinitas. Species, ut videtur, ex affinitate *A. saravschanici* Rgl., pulvinis laxioribus procumbentibusque, foliis vulgo⁷ paulo brevioribus et latioribus atque scapis simplicibus, brevissimis diversa.

33. **A. Varivtzevae** Czerniak. sp. n. (Sect. *Staticopsis* Boiss.).

Fruticulus densiuscule subhemisphaerico-pulvinatus, ramis sat dense foliosis; folia aestivalia viridula, plano-triquetra, lineari-subulata, rigida, 1—1.5 cm longa et ca. 0.5—1 mm lata, apice acerosa, supra plus minusve dense et brevissime puberula vel glabra, margine minute ciliato-scabra; folia vernalia paulo breviora, ceterum similia. Scapi folia paulo superantes, 3—5 cm alti, simplices, glabri vel brevissime pubescentes; spicae ca. 1.5—2 cm longae, densiuscule 5—10-spiculatae, plus minusve distincte distichae; spiculae uniflorae, bracteis glabris; bractea exterior ca. 4 mm longa, interioribus subduplo brevior, ovata, angustiuscule membranaceo-marginata, in parte superiore plus minusve sensim acuminata, apice mucronata; bractee interiores calycis tubum aequantes vel eum paulo superantes, latissime membranaceo-marginatae, apice obtusato-acutatae vel rotundatae, muticae vel breviter mucronatae; calyx ca. 10 mm longus; tubus eius ca. 6 mm longus, inter nervos sparse pilosulus; limbus purpureus, ca. 4 mm latus, plus minusve distincte 10-lobus, nervis glabris, ad marginem usque productis; petala rosea.

Habitat. Montes Pamir, in decliviis saxosis, ca. 3000—4000 m s. m.

Typus. Asia Media. Tadzhikistania, prov. Badachschania montana; Pamir australis, in decliviis montium Chargusch, non procul a lacu Zorkul, 6 VIII 1935, leg. N. Kusnetzov et E. Varivtzeva; ibid., in ascensu ad trajectum Jamg, 24 VII 1904, leg. B. Fedtschenko (paratypus); in Herb. Inst. bot. nom. V. Komarovii Ac. Sc. URSS (Leninopoli) conservatur.

Affinitas. Species, ut videtur, ex affinitate *A. langarici* O. et B. Fedtsch., foliis brevioribus latioribusque, vulgo puberulis atque bracteis spicularum brevioribus differt.

34. **A. pamiricum** Czerniak. sp. n. (Sect. *Staticopsis* Boiss.).

Fruticulus dense subhemisphaerico-pulvinatus, ramis sat dense foliosis; folia aestivalia viridia, plano-triquetra, anguste lineari-lanceolata vel

739 subulata, rigida, (1) 1.5—2 (3) cm longa et ca. 1 mm lata, apice acerosa, glabra (vel, interdum, supra sparse puberula), margine minute ciliato-scabra; folia vernalia conspicue breviora et latiora (ad 1.5—2 mm lata), ceterum similia. Scapi subelongati, folia plus minusve longe superantes, ad 6—12 cm alti, simplices vel in parte superiore 1—2-ramosi, glabri; spicae ca. 1.5—2 cm longae, densiuscule 5—7-spiculatae; spiculae uniflorae, bracteis glabris; bractea exterior ca. 2.5—4 mm longa, interioribus ca. 2—3-plo brevior, late ovata, angustiuscule membranaceo-marginata, in parte superiore subrotundata vel plus minusve sensim acutata, apice breviter mucronata; bractee interiores calycis tubum paulo superantes vel eum subaequantes, late membranaceo-marginatae, apice obtusato-acutatae vel rotundatae et, interdum, vix bilobae, muticae vel breviter mucronatae; calyx ca. 10—11 mm longus; tubus eius ca. 6 mm longus, inter nervos (plerumque in parte superiore) breviter sparseque pilosulus; limbus albus, ca. 4—5 mm latus, plus minusve distincte 10-lobus, nervis glabris, ad marginem usque productis; petala rosea.

Habitat. Montes Pamir, in decliviis saxosis, ca. 3000—4000 m s. m.

Typus. Asia Media. Tadzhikistania, prov. Badachschania montana; Pamir australis, systema fl. Aliczur, in decliviis saxosis septentrionali-occidentalibus partis australis montium Bulunkul, 15 VIII 1935, n° 674, leg. E. Varivtzeva et N. Kusnetzov; in Herb. Inst. bot. nom. V. Komarovii Ac. Sc. URSS (Leninopoli) conservatur.

Affinitas. Species e grege *A. alata* Bge., scapis semper glaberrimis, non raro breviter ramosis, bracteis exterioribus spiculis brevioribus, foliis interdum supra puberulis diversa.

35. *A. velutinum* Czerniak. sp. n. (Sect. *Staticopsis* Boiss.).

Fruticulus densiuscule subhemisphaerico-pulvinatus; folia aestivalia griseo-viridia, plano-triquetra, lineari-subulata, rigidissima, 1.5—2.5 (4) cm longa et ca. 1—1.5 mm lata, apice acerosa, breviuscule et plus minusve dense (non raro subvelutino) puberula; folia vernalia paulo breviora et latiora, subglabra vel glabra, ceterum similia. Scapi folia fere non superantes vel paulo superantes, 3—5 cm alti, simplices, dense (subvelutino) pubescentes; spicae ca. 2—2.5 cm longae, densiuscule 5—7 (11)-spiculatae; spiculae uniflorae, bracteis plus minusve dense puberulis vel glabris; bractea exterior ca. 5—6 mm longa, interioribus ca. 1.5-plo brevior, oblongo-ovata vel ovata, latiuscule membranaceo-marginata, in parte superiore plus minusve sensim acutata, apice mucronata; bractee interiores calycis tubum conspicue superantes, late membranaceo-marginatae, apice obtusato-acutatae vel rotundatae, mucronatae vel muticae; calyx ca. 10—12 mm longus; tubus eius ca. 6—7 mm longus, inter nervos (interdum in parte superiore tantum) breviter sparseque pilosulus; limbus albus (interdum secus nervos anguste purpureo coloratus), ca. 4—5 mm latus, plus

740 minusve distincte 10-lobus, nervis pilosulis vel glabris, ad marginem usque (vel vix ultra) productis; petala rosea.

Habitat. Montes Pamiro-Alaj, in decliviis saxosis.

Typus. Asia Media. Tadzhikistania, prov. Leninabad; systema fl. Fan-darja, in angustis Makschevat, 18 VI 1870, leg. O. Fedtschenko; ibid., in decliviis stepposis vallis fl. Dzhidzhikrut, 3100 m, 5 VIII 1938, n° 33, leg. G. Grigorjev (paratypus); in Herb. Inst. bot. nom. V. Komarovii Ac. Sc. URSS (Leninopoli) conservatur.

Affinitas. Species e grege *A. alata* Bge., proxima *A. kokandensi* Bge., a quo pubescentia densiore (saepae subvelutina) foliorum, scaporum et interdum bractearum atque foliis latioribus rigidioribusque sat distincta.

36. *A. Titovii* Lincz. sp. n. (Sect. *Staticopsis* Boiss.).

Fruticulus dense subdepresso- vel subhemisphaerico-pulvinatus, ramis brevibus dense foliosis; folia aestivalia glaucescenti-viridia, plano-triquetra, lineari-subulata vel acicularia, rigida, (0.5) 1—1.5 (2) cm longa et ca. 0.5—1 mm lata, apice acerosa, breviter et plus minusve dense puberula vel glabra, margine (interdum parte inferiore tantum) minute ciliato-scabra; folia vernalia paulo breviora et vix latiora, ceterum similia. Scapi folia multo (rarius paulo) superantes, (2) 4—7 cm alti, simplices vel (rarius) vix ramosi, breviter denseque pubescentes; spicae ca. 2—2.5 cm longae, laxiuscule et plus minusve distincte distiche 4—6-spiculatae; spiculae uniflorae, bracteis glabris vel vix puberulis; bractea exterior ca. 6—7 mm longa, interioribus ca. 1.5-plo brevior, oblongo-ovata, angustiuscule membranaceo-marginata, in parte superiore sensim acutata, apice cuspidata; bractee interiores calycis tubum paulo superantes vel eum subaequantes, late membranaceo-marginatae, apice plus minusve obtusato-rotundatae, longius (ca. 1—1.5 mm) cuspidatae; calyx ca. 11—12 mm longus; tubus eius ca. 7 mm longus, inter nervos sparse pilosulus; limbus albus, ca. 4 mm latus, subdistincte 10-lobus, nervis glabris, ad marginem evanidis vel marginem attingentibus; petala rosea vel intense rosea.

Habitat. Montes Czu-Ilienses, in decliviis saxosis, ca. 1500 m s. m.

Typus. Asia Media. Kazachstania, prov. Dzhambul; montes Czu-Ilienses, declivia abrupta prope cacumen Kendyktau, 18—19 VII 1914, leg. V. Titov; in Herb. Inst. bot. nom. V. Komarovii Ac. Sc. URSS (Leninopoli) conservatur.

Affinitas. *A. alata* Bge. affine est, sed pulvinis densioribus, foliis brevioribus angustioribusque, scapis altioribus interdum ramosis, spicis laxioribus atque bracteis interioribus longius (ad 1—1.5 mm) cuspidatis bene differt.

37. *A. Knorringianum* Lincz. sp. n. (Sect. *Staticopsis* Boiss.).

Fruticulus dense subhemisphaerico-pulvinatus, ramis dense foliosis; folia aestivalia viridia, plano-triquetra, anguste lineari-lanceolata, rigida,

741 0.8—1 (1.5) cm longa et ca. 1 mm lata, apice acerosa, glabra, margine minute ciliato-scabra; folia vernalia paulo breviora, ceterum similia. Scapi folia fere non superantes, simplices; spicae subsessiles, ca. 1.5—2.5 cm longae, laxae 2—5-spiculatae; spiculae uniflorae, bracteis glabris; bractea exterior ca. 7—8 mm longa, interioribus ca. 1.5-plo (vel paulo minus) brevior, ovato-lanceolata, latiuscule membranaceo-marginata, in parte superiore sensim acutata, apice longiuscule cuspidata; bractee interiores calycis tubum paulo superantes vel eum subaequantes, latissime membranaceo-marginatae, in parte superiore sensim acutatae, apice longiuscule cuspidatae; calyx ca. 14—17 mm longus; tubus eius ca. 8—9 mm longus, inter nervos sparse vel sparsissime pilosulus (subglaber); limbus albus, ca. 6—8 mm latus, obsolete 10-lobus, nervis purpureis, glabris, usque ad marginem productis (vel in sinibus loborum vix prominulis); petala rosea vel intense rosea (?).

Habitat. Montes Tian-Schan occidentalis, jugum Ferganicum.

Typus. Asia Media. Kirghizia, prov. Dzhahalabad; pars occidentalia montis Baubasch-ata, dzhailjau Bogut, in zona subalpina et arboreto-dumosa, 17 VIII 1945, n° 217, leg. O. Knorring et A. Pjataeva; in Herb. Inst. bot. nom. V. Komarovii Ac. Sc. URSS (Leninopoli) conservatur.

Affinitas. Species manifeste *A. Korolkovii* (Rgl.) Korov. affinis est, sed calycibus amplis, limbo latiore etc. eximie differt.

38. *A. Komarovii* Czerniak. sp. n. (Sect. *Staticopsis* Boiss.).

Fruticulus dense vel densissime subhemisphaerico-pulvinatus, ramis densissime foliosis; folia glauca vel glauco-viridia, plano obtusotriquetra vel subplana, anguste lineari-lanceolata vel linearia, rigida, (0.3)0.5—1(1.5) cm longa et ca. 0.5—1 mm lata, in parte superiore sensim angustata, apice longiuscule acuminato-mucronata, glabra, margine minute ciliato-scabra. Scapi folia conspicue superantes, ad 2 cm alti, simplices, breviter denseque pubescentes; spicae ca. 1 cm longae, dense, plus minusve distincte distiche 3—7-spiculatae; spiculae uniflorae, bracteis glabris vel breviter sparseque puberulis; bractea exterior ca. 3—4 mm longa, interioribus ca. 1.5-plo brevior, ovata vel oblongo-ovata, angustiuscule membranaceo-marginata, in parte superiore plus minusve sensim acutata, apice mucronata; bractee interiores calycis tubum conspicue superantes, latissime membranaceo-marginatae vel praeter nervum medium angustum fere omnino membranaceae, apice obtusato-rotundatae, breviter mucronatae vel muticae; calyx ca. 7—9 mm longus; tubus eius ca. 4—5 mm longus, inter nervos breviter et plus minusve sparse pilosulus vel subglaber; limbus albus, ca. 4 mm latus, obsolete 10-lobus vel subtruncatus, nervis purpureis, glabris, paulo ante marginem evanidis vel ad marginem usque productis; petala rosea.

Habitat. Montes Pamiro-Alaj, systema fl. Seravschan, 2500—3000 m s. m.

Typus. Asia Media. Tadzhikestania, prov. Leninabad; systema fl. Seravshan, Margeb (Jagnob), 18 VII 1892, leg. V. Komarov; *ibid.*, Revat, 7 VII 1892, leg. V. Komarov (paratypus); in Herb. Inst. bot. nom. V. Komarovii Ac. Sc. URSS (Leninopoli) conservatur.

Affinitas. *A. parviflora* Rgl. videtur affinis est, forma ejus vicaria (magis alto-montana) apparet, sed pulvinis densioribus, foliis multo brevioribus, atque scapis parum evolutis differt.

39. *A. Nikitinii* Lincz. sp. n. (Sect. *Tragacanthina* Bge.).

Fruticulus laxiuscule subhemisphaerico-pulvinatus, ramis laxe foliosis; folia aestivalia glaucescenti-viridia, planiuscule teretia (subsubulata), rigidissima, 1.5—3 cm longa et ca. 1 mm lata, apice acerosa, glabra, margine plus minusve aequaliter ciliato-scabra; folia vernalia multo (2—4-plo) breviora et conspicue latiora, plano-triquetra, plus minusve breviter acuminato-mucronata, glabra, margine minute ciliato-scabra, carnosula, cito marcescentia et decidua. Scapi folia sat longe superantes, ca. 5—7 cm alti, in parte superiore breviter 2—3 ramosi, glabri; spicae ca. 2 cm longae, laxae (spiculis intervallis ca. 2—3 mm inter se remotis), distincte distiche 2—5-spiculatae; spiculae uniflorae, bracteis glabris; bractea exterior ca. 5 mm longa, interioribus subduplo brevior, oblongo-ovata, anguste membranaceo-marginata, in parte superiore sensim acutata, apice mucronata; bractee interiores calycis tubo ca. 1.5-plo breviores, late membranaceo-marginatae, in parte superiore plus minusve sensim acutatae, apice plus minusve longe (interdum ad 1.5—2 mm) cuspidatae; calyx ca. 14—15 mm longus, subtubulosus, limbo angustissimo; tubus eius ca. 12—13 mm longus, glaber, in parte superiore vix dilatatus; limbus albus, ca. 2 mm latus, profunde 5-lobus, lobis acute triangularibus, nervo glabro, ad marginem excurrente; petala rosea.

Habitat. Turcomaniae australis pars montana (Badghyz dicta), in decliviis saxosis, ca. 1200 m s. m.

Typus. Asia Media. Turcomania, prov. Aschchabad; Badghyz, jugum Gjaz-gjadyk in trajectu Rachnatur, ad declivia septentrionalia, 30 V 1949, leg. V. V. Nikitin; *ibid.*, jugum Gjaz-gjadyk, trajectus Rachnatur, 31 VIII 1930, n° 1028, leg. I. et O. Linczevski (paratypus); in Herb. Inst. bot. nom. V. Komarovii Ac. Sc. URSS (Leninopoli) conservatur.

Affinitas. Species ex affinitate *A. longiflora* Boiss., foliis aestivalibus margine ciliato-scabris (nec glabris), scapis altioribus, bracteis interioribus plus minusve longe cuspidatis (nec muticis), calycibus brevioribus diversa est.

40. *A. mirandum* Lincz. sp. n. (Sect. *Gontscharovia* Lincz.).

Fruticulus dense depresso-pulvinatus, ramis brevibus densissime foliosis; folia glauca, plana, anguste lineari-lanceolata vel linearia, rigidiuscula, (1) 1.5—2.5 (3) cm longa et ca. 1.5—2 mm lata, apice breviter mucronata, glabra, in parte inferiore marginis minute ciliato-scabra. Scapi elongati,

743 folia multo superantes, ad 25—50 cm alti, tenuissimi (basi ca. 0.5 mm in diam.), simplices, subrecti, glabri, laeves; spicae (5) 10—20 cm longae, laxissime 5—13-spiculatae, spiculis distantibus, intervallis longitudinem earum 2—3-plo superantibus; spiculae (2) 3—5-florae (floribus pedicellis ca. 2 mm longis, instructis), bracteis glabris; bractea exterior ca. 1.5 mm longa, primo interiore multo brevior, late triangulato-ovata, angustiuscule membranaceo-marginata, in parte superiore sensim acutata; bractea interior prima ca. 3.5—4 mm longa et 2 mm lata, valde concava et flores partim amplexans, fere lato-obovata, in parte superiore plus minusve sensim acutata, latiuscule (apice latiore) membranaceo-marginata; ceterae interiores multo minores, praeter nervum angustum membranaceae; calyx ca. 5 mm longus et 1 mm (in parte media) in diam., anguste obconicus, in parte superiore paulo (praecipue fructificationis tempore) dilatatus; tubus eius toto longitudine ad nervos longe denseque pilosulus; limbus albus, 10-lobus, lobis inaequalibus, de quibus quinque longioribus (ca. 1 mm longis), anguste triangularibus, nervo plus minusve conspicue ultra marginem prominulo et quinque multo brevioribus, rotundatis, enerviis; petala pallide rosea (?).

Habitat. Montes Pamiro-Alaj Asiae Mediae.

Typus. Asia Media. Jugum Hissaricum (? systema fl. Tupalang), 1938, leg. N. Gontscharov; in Herb. Inst. bot. nom. V. Komarovii Ac. Sc. URSS (Leninopoli) conservatur.

Affinitas. Ab *A. miro* Lincz. scapis simplicibus, spicis laxissimis, longis, tubo calycino toto longitudine (nec dimidio inferiore tantum) ad nervos pilosulo differt; a congeneribus ceteris characteribus sectionis diversum.

41. *A. mirum* Lincz. sp. n. (Sect. *Gontscharovia* Lincz.).

Fruticulus dense depresso-pulvinatus, ramis brevibus densissime foliosis; folia glauca vel virescenti-glauca, plana, anguste lineari-lanceolata vel linearia, rigidiuscula, 1—1.5(2) cm longa et ca. 1—1.5(2) mm lata, apice breviter mucronata, glabra, in parte inferiore margine minute ciliato-scabra. Scapi elongati, folia multo superantes, ad 15—20 cm alti, tenuissimi (basi ca. 0.5 mm in diam.), in parte superiore breviter racemiformi paniculato-ramosi, rarior simplices, subrecti, glabri, laeves; spicae 1.5—2.5 cm longae, plus minusve dense 4—13-spiculatae; spiculae 2—4-florae (floribus pedicellatis, pedicellis ca. 2 mm longis), bracteis glabris; bractea exterior ca. 2 mm longa, interioribus primis multo brevior, late triangulato-ovata, anguste membranaceo-marginata, in parte superiore sensim acuminata; bractea interior prima ca. 4—5 mm longa et 2.5—3 mm lata, valde concava et flores partim amplexans, late rotundato-ovata, in parte superiore plus minusve sensim acuminata, angustiuscule (apice vulgo latiore) membranaceo-marginata; ceterae interiores conspicue minores, praeter nervum angustum membranaceae; calyx ca. 5 mm longus et 1 mm (in parte

744 **media**) in diam., anguste obconicus, in parte superiore paulo (praecipue post anthesin) dilatatus; tubus eius in dimidio inferiore ad nervos longe sparseque pilosulus; limbus albus, 10-lobus, lobis inaequalibus, de quibus quinque longioribus (ca. 1 mm longis), rotundato-triangularis, nervo usque ad apicem producto vel vix ante apicem evanido et quinque multo brevioribus, rotundatis, enerviis; petala pallide rosea (?).

Habitat. Montes Pamiro-Alaj Asiae Mediae.

Typus. Asia Media. Jugum Hissaricum (? systema fl. Tupalang), 1938, leg. N. Gontscharov; in Herb. Inst. bot. nom. V. Komarovii Ac. Sc. URSS (Leninopoli) conservatur.

Affinitas. Ab *A. mirando* Lincz. scapis ramosis, spicis brevibus densioribusque, tubo calycino dimidio inferiore tantum (nec toto longitudine) ad nervos pilosulo differt; a congeneribus ceteris characteribus sectionis distinctum.

42. Sectio Gontscharovia Lincz. sect. n.—Spiculae 2—5-florae, in spicam brevem et plus minusve densam vel elongatam et laxam dispositae; scapi simplices vel pauciramosi; bracteae spicularum exteriores minutae, anguste membranaceo-marginatae; calyx subtubulosus (anguste obconicus), basi valde obliquus; limbi calycini nervi angusti, intus glabri; folia in parte inferiore margine scabra, ceterum glabra, vernalia et aestivalia subconformia, plana, latiuscula.—Typus sectionis: *Acantholimon mirandum* Lincz.

43. LIMONIOPSIS Lincz. gen. nov.

Calyx subtubulosus, tenuiter membranaceus, basi valde obliquus, limbo anguste campanulato, 10-lobo, nervis quinque, latiusculis, herbaceis, in parte inferiore approximatis, intus glabris; corolla parva, calycem paulo (minus quam sesqui) superans; petala sublibera, ima basi breviter cyathiformiter connata, in parte superiore paulo reflexa, in parte inferiore in tubum cohaerentia (marginibus appositis), post anthesin confluenti-involuta; filamenta glabra, in parte superiore libera, ima basi tantum partibus basalibus valde (usque ad latitudinem petalorum) dilatatis inter se et cum petalis breviter (ad dimidium ovarii) cyathiformiter connata; styli a basi liberi, glabri; stigmata depresso (irregulariter hemisphaerico) capitata; ovarium anguste fusiformi-lineare, in parte superiore gradatim insensibiliter in stylum transiens; fructus oblongo linearis (apice non dilatatus), operculo rotundo apice dehiscens et valvatim fissilis. Planta perennis, caudice brevi, lignoso, foliis minutis, carnosius, rosulatis, floribus parvis, pallide roseis, in spiculis 1—5-floris laxissime spiciformiter in ramis scaporum tenuissimorum multoties paniculato-ramosorum dispositis.

A generibus *Limonium* Mill., *Gontolimon* Boiss. et *Acantholimon* Boiss. differt: a primo—stigmatibus capitatis (nec filiformi-cylindri-

745 cis), a secundo—stylis glabris (nec longiuscule papillosis) et toto habitu, a tertio—foliis carnosis, latis, late obovatis vel spathulatis (nec rigidis, lineari-subulatis) habituque omni.

Species unica—*Limonopsis Overtonii* (Boiss.) Lincz., Caucaso orientali (Daghestaniae) nec non Anatoliae orientali (secus Euphrates superiorem) propria.

44. **IKONNIKOVIA** Lincz. gen. nov.

Calyx subtubulosus, tenuiter membranaceus, basi rectus, limbo anguste campanulato, quinquelobo, nervis quinque, herbaceis, intus glabris; corolla ampla, calycem duplo superans; petala sublibera, ima basi annulatum connata, in parte superiore reflexa, in parte inferiore in tubum cohaerentia (marginibus appositis), post anthesin confluenti-involuta; filamenta glabra, sublibera, ima basi cum petalis connata, in parte inferiore sat valde dilatata; styli a basi liberi, in dimidio inferiore minutissime verruculosi (nec longiuscule papilloso); stigmata depresso (hemisphaerico) capitata; ovarium anguste lineari-cylindricum, in parte superiore valde angustatum et gradatim et insensibiliter in stylum transiens; fructus oblongo linearis (apice non dilatatus), operculo rotundo apice dehiscens et valvatis fissilis. Fruticulus nanus, ramis breviusculis, crassis, foliis sat latis, rigide coriaceis, dense rosulatis, floribus amplis, violaceo-rubris, in spiculis 3—4-floris in spicas densas ad ramos laterales scaporum numerosorum, simpliciter (semel tantum) paniculato ramosorum dispositis.

Genus a *Goniolimone* Boiss. stylis minutissime verruculosus (nec longiuscule papillosus), ovario anguste lineari-cylindrico (nec ovato vel oblongo-ovato), in parte superiore valde angustato et gradatim insensibiliter (nec subito) in stylum transiente, scapis numerosis, tenuibus, habitu distincte fruticuloso differt; ab *Acantholimone* Boiss. foliis multo latioribus, inflorescentiis aliis, stylis minutissime verruculosus (nec glaberrimis) distinctum. An inter species generum supra laudatas hybrida est?

Species unica—*Ikonnikovia Kaufmanniana* (Rgl.) Lincz., Asiae Mediae orientali (systema fl. Ili in montibus Tian-Schan septentrionali-orientalis) nec non prov. Sinkiang (Sinj-tzjan) Republicae popularis Chinensis partibus finitimis propria.

GONIOLIMON Boiss.

45. Sectio 1. **Unicuspidaria** Lincz. sect. n.—Bractea spiculae interior prima semper unicuspidata.—Typus sectionis: *Goniolimon elatum* (Fisch.) Boiss.

46. Sectio 2. **Tricuspidaria** Lincz. sect. n.—Bractea spiculae interior prima (1) 2—3-cuspidata.—Typus sectionis: *Goniolimon spectiosum* (L.) Boiss.

47. Subsectio 1. **Platycalyx** Lincz., sect. *Tricuspidaria* subsect. n.
—Calyx late infundibuliformis, lobis brevibus, latis, plus minusve obtusatis. — Typus subsectionis: *Gontolimon speciosum* (L.) Boiss.

48. Subsectio 2. **Stenocalyx** Lincz., sect. *Tricuspidaria* subsect. n.
—Calyx anguste infundibuliformis, lobis longis angustisve, plus minusve acutis. — Typus subsectionis: *Gontolimon tataricum* (L.) Boiss.

CEPHALORRHIZUM M. Pop. et Korov.

49. **C. turcomanicum** M. Pop. sp. n.

Planta perennis ad 35—45 cm alta; radix crassa; collum ob foliorum vetustorum reliquia vestitum ovoideo vel sphaeroideo incrassatum, ad 5 cm in diam.; folia omnia rosulata, sat numerosa, rigidiuscule carnosae, glaucae vel virescenti-glaucæ, oblongo-spathulatae, 4—7 cm longae, omnia dense calcareo-punctata, margine dense minuteque ciliato-scabra; laminae eorum ad 2—3 cm latae, late rotundato-spathulatae, rarius rotundato-hastatae, in parte superiore obtusato-rotundatae vel vix acutatae, apice breviter tenuiterque cuspidatae, basi in petiolos latos, planos sensim attenuatae. Scapi in numero 2—3, erecti, crassi, firmi, in dimidio superiore simpliciter (semel tantum) paniculato-ramosi, ramulis tenuibus brevibusque, multiarticulati, fragiles (superne praesertim), squamis ad nodos articulorum sat magnis, triangularibus vel triangulari-ovatis, plus minusve longius acutatis, membranaceo-herbaceis, laxe calcareo-punctati, sublaeves, nitidi; flores in spicas densas, 3—6-spiculatas, subsphaericas vel paulo oblongatas, ca. 1.5—2 cm longas dispositi; spiculae ca. 10 mm longae et 15 mm latae, 2—3(4)-florae, bracteis (in spiculo trifloro quinis) glabris; bractea exterior ca. 8—10 mm longa et lata, interioribus conspicue brevior, irregulariter rotundato-cordata, in parte media (coriaceo-herbacea) late ovata, breviter cuspidata, cuspidibus ultra marginem vix prominulis, in marginem latissimum (ad 3—4 mm latum), undulatum, albo-membranaceum subito transiens; duae primae bractee interiores exteriori simillimae, sed conspicue majores, calycem suboccultatae, in parte herbacea angustiore; cetera interiora multo breviora minoraque, praeter nervum angustum ante apicem evanidum membranacea; calyx 8—10 mm longus, infundibuliformis, toto glaberrimus; tubus eximie quinque costatus, costis dorso rotundatis, totus coriaceo-herbaceus (ad costas vix tenuior), nervis latissimis, planis, inter se conjunctis; limbus ca. 2.5—3 mm latus, albus, obsolete quinquelobus, nervis latis crassisque, apice obtusato-acuminatis, conspicue ante limbi mediam subito evanidis; petala violaceo-rubra, apice non profunde sinuata.

Habitat. In rupestribus et decliviis lapidosis montium Kopetdagh Turcomaniae.

Typus. Asia Media. Turcomania, prov. Aschchabad; in jugo Kopetdagh orientali, in valle Schorlok, 19 V 1948, leg. C. Blinovski; in Herb. Inst. bot. nom. V. Komarovii Ac. Sc. URSS (Leninopoli) conservatur.

Affinitas. A *C. oopodo* M. Pop. et Korov. scapis semel tantum (nec multoties) ramosis, spiculis 2—4-floris (nec unifloris) etc. eximie differt.

LIMONIUM Mill.

50. *L. Michelsonii* Lincz. sp. n. (Sect. *Platyhymenium* Boiss.).

Planta perennis, 10—25 cm alta, tota (praeter calycem) glabra, radice sat tenui, caudice plus minusve incrassato; folia omnia radicalia, non numerosa, glaucescenti-viridia, plus minusve late spatulata, 1.5—4 cm longa et (0.3) 0.5—1 cm lata, superne rotundata, in parte inferiore in petiolum planum, quam lamina brevior vel eam subaequantem sensim angustata. Scapi in numero 5—15, adscendentes vel suberecti, omnes teretes, in toto longitudine (raro superne tantum) dense minuteque verrucosi, valde flexuosi, fere a basi paniculato-ramosi, internodiis brevibus, plus minusve curvatis, ramulis sterilibus vulgo atque ramosis sat numerosis; spicae 1—1.5 cm longae, dense 5—10-spiculatae, ad ramorum extremitatem binae-ternae subcapitato congestae; spiculae 4—7 (10)-florae (floribus sat longe, ad 1—1.5 mm, pedicellatis); bractea exterior 2.5—3 mm longa, interiore prima duplo (vel etiam magis) brevior, late ovata, apice obtusata vel interdum vix sinuata, latissime membranaceo-marginata; bractea interior prima exteriore similis, sed multo major, valde concava et flores partim amplexens, latissime membranaceo-marginata; calyx 4.5—6 mm longus, late infundibuliformis; tubus obconicus, 2.5—3 mm longus et ca. 1 mm in diam., in toto longitudine dense et plus minusve longe pilosulus; limbus 2.5—3 mm latus, albidus vel pallide-lilacinus, quinquelobus, lobis sat brevibus, late triangularibus, apice rotundatis et interdum vix sinuatis, nervis in toto longitudine vel tantum in parte inferiore breviter pilosulis, vulgo ultra marginem mucronulato prominulis; petala flava.

Habitat. Montes Tian-Schan Asiae Mediae orientalis, in valle fl. Kegen et in montibus adjacentibus, praecipue in salsuginosis.

Typus. Asia Media. Kazachstania, prov. Alma-Ata; in valle fl. Kegen inter Kara-saz et Kegen-saz, 9 VII 1910, leg. A. Michelson (Ed. H. B. P. n° 43, sub *Statice leptoloba* Rgl.); in Herb. Inst. bot. nom. V. Komarovii Ac. Sc. URSS (Leninopoli) conservatur.

Affinitas. A *L. dichroantho* (Rupr.) Ik.-Gal. calycis limbis interdum pallide-lilacinis (nec pallide-flavis), a *L. leptolobo* (Rgl.) Ktze. calyce brevior, lobis limbi brevibus, latis, rotundatis, ab ambobus scapis dense minuteque verrucosis, valde flexuosis, internodiis brevioribus, ramulis sterilibus sat numerosis (nec subnullis) eximie differt.

51. *L. Rezniczenkoanum* Lincz. sp. n. (Sect. *Platyhymenium* Boiss.).

Planta perennis, ca. 40 cm alta, radice crassa, lignosa; caudex pluriceps, breviramosus, reliquiis petiolorum vetustorum dense tectus; folia omnia radicalia, sat numerosa, glaucescenti-viridia, anguste et oblongo-

748 *spathulata*, 3—6 cm longa et 0.4—0.6 cm lata, superne acuminata vel plus minusve rotundata, breviter mucronata, in parte inferiore in petiolum planum quam lamina multo (ad duplo-triplo) longiorem sensim angustata. Scapi in numero 10—12, erecti, inferne teretes, superne vix angulati, vix flexuosi, subrecti, fere a basi multoties, recte vel subrecte paniculato-ramosi, ramulis sterilibus numerosis, solitariis, plus minusve longis et vulgo atque ramosis, squamis ad basin ramorum sterilium minutis, herbaceo-membranaceis; spicae ca. 1.5 cm longae, dense 5—7-spiculatae, ad ramorum principalium extremitatem binae-ternae subcapitato congestae; spiculae 2—4-florae (floribus sat longe, ca. 1 mm, pedicellatis); bractea exterior ca. 3—4 mm longa, prima interiore 2—2.5-plo brevior, late ovata vel subrotunda, obtusiuscula, interdum brevissime mucronata, late membranaceo-marginata, glabra; bractea interior prima exteriori similis, sed multo major, valde concava et flores amplexans, latissime citrino-membranaceo-marginata, glabra; ceterae interiores (ad flores singula tantum) paulo minores, praeter nervum angustum ante apicem evanidum membranaceae; calyx ca. 10 mm longus, late infundibuliformis; tubus obconicus, ca. 5 mm longus, in toto longitudine dense et sat longe pilosulus; limbus ca. 5 mm latus, citrinus, 10-lobus, lobis quinque alternantibus amplis, triangulato-ovatis, superne acuminatis, nervo in parte inferiore breviter pilosulo, ad apicem usque producto vel vix ultra prominulo et intermediis minoribus, obtusiusculis vel acutiusculis, enerviis; petala aurantiaco-flava.

Habitat. In decliviis jugi Saur Kazachstaniae orientalis.

Typus. Asia Media. Kazachstania orientalis, distr. Zaissan; jugum Saur, in decliviis orientalibus montium ad confluencem fluminum Oj-karagaj et Aba, 11 VII 1907, n° 344, leg. V. et A. Reznitzenko; in Herb. Inst. bot. nom. V. Komarovii Ac. Sc. URSS (Leninopoli) conservatur.

Affinitas. Species insignis, *L. Klementzii* Ik.-Gal., ut videtur, affinis, sed statura altiore, scapis suberectis, ramulis sterilibus vix (nec valde) reflexis, longis, rectis vel subrectis, foliis longioribus angustioribusve, longepetiolatis atque bracteis spicularum glabris (nec pilosis) eximie differt.

52. *L. Fajzievii* Zakirov sp. n. (Sect. *Siphonocalyx* Lincz.).

Planta perennis, 40—60 cm alta, radice sat crassa; caudex (in exemplaribus bene evolutis) valde incrassatus, lignosus, pluriceps, breviramisus, reliquiis petiolorum vetustorum sat dense tectus; folia omnia radicalia, sat numerosa, glauco-viridia, oblongo-obovata vel spathulata, 2—4 cm longa et 0.5—1 cm lata, superne plus minusve rotundata, breviter attenuato-mucronata, in parte inferiore in petiolum latum, planum, laminam plus minusve aequantem vel eam conspicue brevioris sensim angustata. Scapi in numero 1—5, erecti, plus minusve teretes, glabri, sat flexuosi, fere a basi multoties et longe ramosi, in dimidio inferiore ramulis sterilibus paucis vel nullis; spicae 1—3 cm longae, vulgo falcato-curvatae, dense 5—15 (20)-spiculatae, ad ramorum extremitatem binae-ternae congestae vel

749 solitariae; spiculae 3—5-florae (floribus sat longe, ca. 1 mm, pedicellatis); bractea exterior 5—6 mm longa, prima interiore ca. 1.5-plo brevior, valde concava et eam amplexens, late ovata, apice plus minusve acuminata, non raro breviter carinato-mucronata, late membranaceo-marginata, glabra vel vix puberula; bractea interior prima exteriore similis, sed multo major, apice plus minusve mutica, latissime membranaceo-marginata, valde concava et flores partim amplexens, inferne glabra, superne longe denseque, minutissime glanduloso-pubescent; ceterae interiores (ad flores singula tantum) multo minores (calycis tubum subaequantes), praeter nervum angustum ante apicem evanidum membranaceae, apice rotundatae vel irregulariter truncatae; calyx ca. 6 mm longus, tubulosus, limbo recto vel vix reflexo; tubus ca. 3 mm longus et 1 mm in diam., in totam longitudinem longe denseque, minutissime glanduloso-pubescent; limbus ca. 3 mm latus, albidus vel subroseus, quinquelobus, lobis brevibus (ca. 1 mm longis), plus minusve anguste triangularibus, acutis vel plus minusve obtusiusculis, nervo glabro, ad apicem usque producto vel ante apicem evanido; petala caesio-violacea.

Habitat. In montibus Seravschanicis Asiae Mediae, in decliviis varii coloribus gypsaceis.

Typus. Asia Media. Tadzjikistania, prov. Leninabad; systema fl. Seravschan, ad declivia argilloso-gypsacea prope pag. Vischist, 17 VII 1941, leg. Zakirov; in eodem loco, 14 VII 1941, leg. Fajziev (paratyrus); in Herb. Universitatis As. Med. (Taschkent) conservatur.

Affinitas. A *L. drepanostachyo* Ik.-Gal. bracteis exterioribus amplis (5—6 mm longis), lobis calycinis majoribus acutioribusque atque pubescentia bractearum calycisque minutissime glandulosa (nec simplici) bene differt.

53. Sectio **Siphonocalyx** Lincz. sect. n.—Calyx tubulosus (nec infundibuliformis vel obconicus), limbo recto vel vix reflexo, basi rectus vel subrectus; herbae perennes.—Typus sectionis: *Limonium sogdianum* (M. Pop.) Ik.-Gal.

PSYLLIOSTACHYS (Jaub. et Sp.) Nevski

54. **P. Androssovii** Roshk. hybr. n.

Toto habitu *P. ancipitem* (Rgl.) Roshk. admonet, sed characteribus sequentibus eximie differt: foliis subregulariter pectinatim pinnatipartitis (ut in *P. leptostachya* (Boiss.) Roshk., sed laciniis conspicue latioribus), scapis minus alatis et crebrius ramosis, inflorescentiis angustius spicatis (sed quam in *P. leptostachya* latioribus) cum spica centrali multo longiore, floribus subduplo minoribus (corolla ca. 3.5 mm longa, calyx ca. 2 mm longus, calycis loborum aristae ca. 0.5 mm longae), pallide roseis, fere albis, in fasciculos regulariter vel subregulariter trispiculatos (ut in *P. leptostachya*) dispositis. Ob characteres intermixtos intermediosve inter *P. ancipitem* et *P. leptostachyam* verosimiliter hybrida est.

750 **Habitat.** In planitiibus Asiae Mediae circa urbem Buchara nec non in partibus australibus arenarum Kyzyl-kum, in salsuginosis, cum *P. ancipite* et *P. leptostachya* iisdem locis.

Typus. Asia Media. Uzbekistania, prov. Buchara; in agris derelictis subsalsis prope stationem ferroviariae Kagan, 15 V 1903, leg. N. Androssov; in Herb. Inst. bot. nom. V. Komarovii Ac. Sc. URSS (Leninopoli) conservatur.

FRAXINUS L.

55. *F. Pojarkoviana* V. Vassil. sp. n. (*Fraxinaster*, sect. *Melioides*, series *Angustifoliae*).

Arbor ad 20 m alt. et magis; ramuli griseo-fusci, glabri; gemmae atrofuscae; folia ramulorum sterilium opposita, ramulorum fertilium ternato verticillata, foliolis 9—11, jugis eorum valde distantibus; foliola semicoriacea, nuda, anguste-elliptica, lanceolata vel lineari-lanceolata, viridia vel atroviridia; interdum foliola supra, rachis primarius foliorum foliorumque rubrae; foliola marginibus mucronate-dentata, ad apicem et basi angustata longe cuspidata, 3—10 cm longa, 0.8—2 cm lata, praeter foliolam supremam subsessilia. Inflorescentiae dispositae in axillis foliorum anni praecedenti uno racemo in axilla folii; rachis primarius racemi 3—4—6 cm longus; samarae 3.5—5 cm longae, ad apicem dilatatae, emarginatae, ad basin angustatae nuculis duplo brevioribus.

Typus: Ucrainskaja SSR. Regio Transcarpatica Districtus Beregovsky, in vicinitate p. Schalanka. Silva Fraxinetum quercosum; leg. K. Igoshina, 1 IX 1949.

A F. angustifolia Vahl, cui proxima est, samaris longioribus apice emarginatis differt.

Habitat ad ostia fl. Dniepr, Dniestr; Ukraina Transkarpatica, Bulgaria australis.

GENTIANA L.

56. *G. kurilensis* Grossh. sp. n. (sect. *Chondrophylla* Bge.).

Glabra atroviridis, rhizomate repente ramoso caudiculis plurimis epigeis, caulibus firmis erectis 7—10 cm alt.; folia elongato-ovata obtusa coriacea marginata 7—13 mm lg., 3—4(6) mm lt.; floribus 5—6 caulem apice adscendentem ramosque apicales inaequilongos terminantibus; calyce campanulato non fisso quinquedentato 5—6 mm lg., laciniis ovato lanceolatis acutis apice recurvis; corolla atro-coerulea tubuloso-campanulata 11—14 mm lg., lobis suberectis ovatis obtusis ca. 4 mm lg. triplo tubulum superantibus, plicis lobos duplo brevioribus elongatis apice non angustatis inaequaliter denticulatisque; staminibus tubum aequantibus, antheris oblongis liberis, filamentis anguste alatis; ovario oblongo stipitem stylumque superante, stigmatibus ovatis.

Habitat. In paludosis insularum Kurilensium.

Typus: insula Companejsky, promontorium Chitore, 27 VII 1946, leg. D. P. Vorobjev; in Inst. Bot. nom. V. Komarovii Ac. Sc. URSS conservatur.

A *G. nipponica* Maxim. caulibus erectis 5—6-floris, foliis latioribus, corollis minoribus atro-coeruleis differt.

57. *G. Vvedenskyi* Grossh. sp. n. (sect. *Crossopetalum* Froel.).

Annua vel biennis glabra viridis; caules erecti (15)20—40 cm alt. raro simplices, vulgo a basi ramosi, pedunculis unifloris 10—30 cm lg., folia radicalia rosulata persistentia elongato-spathulata obtusa; folia caulina lineari-lanceolata vel linearia acuta 20—35 mm lg., 2—3(4) mm alt. basi non coalita; calyx anguste campanulatus (18)24(33) mm lg. corolla sesqui minor dentibus inaequalibus: breviores — triangulares acuti margine membranacei, longiores — (8)11(19) mm lg. lanceolato-subulati acuminati; corolla anguste campanulata atro-coerulea (25)32(36) mm lg., 7—10 mm lat. ad tertiam lobata, lobis elongatis obtusis apice minute serrulatis (10)11(13) mm lg. margine laevis non fimbriatis; stylus brevis stigma late-elongatum; capsula ovato-elongata brevistipitata; semina ovata 0.2—0.3 mm lg. squamis pellucidis tecta.

Habitat in humidis paludosisque regionis alpinae montium Asiae mediae et Mongoliae.

Typus: Pamir, Langarsu, in humidis, 17 VIII 1857, leg. S. Korshinsky.

A *G. detonsa* Rottb. cui similis dignoscit totae plantae magnitudine atque dentibus calycinis paulo inaequalibus.

58. *G. pamirica* Grossh. sp. n. (sect. *Arctophila* Griseb.).

Annua vel biennis glabra viridis; caules 1—4 cm alt. simplices vel a basi fasciculatim ramosi, ramis arcuatim adscendentibus; folia rosulata oblanceolato-elongata basi angustata apice rotundata, 6—9 mm lg., 2 mm lt. caulina ovata vel lanceolata obtusa 6—8 mm lg., 3—4 mm lt.; flores quinquefidi non involucrati, pedicellis glabris elongatis; calyx usque ad basin fissus, 3—4 mm lg. dentibus paulo inaequilongis linearibus superne dilatatis apice uncinatim acuminatis; corolla tubuloso-campanulata coerulescenti-violacea ca. 6 mm lg., in fauce 2—3 mm lt., lobis elongato-ovatis tubulo aequilongis obtusis sed apice mucrone nigro instructis; antherae coeruleae; capsula elongato-ovata sessilis corollae subaequalis; semina 0.1—0.2 mm lg. suborbiculata laevia cinnamomea.

Habitat in pratis alpinis.

Typus: Pamir, Schugnan; in pratis flum. Gunt prope pagum Vedsh, 31 VII 1931, leg. S. Lipschitz.

Haec species a *G. sibirica* (Kusn.) Grossh. differt floribus paucis non involucratis, totae plantae magnitudine minori.

59. Sectio 2. **Vincopsis** Pobed. sect. nova. — Corolla pallide coerulea vel rosea, tubo violaceo, fauce pilosa; stamina medio tubi inserta; folia sessilia, caules recti, simplices, fragiles.

Sectio monotypica: *V. erecta* Rgl. et Schmalh. in Asia Media sistens.

ANTITOXICUM Pobed.

60. Sectio 1. **Euantitoxicum** Pobed. sect. nova. — Lobi coronae carnosi, rotundati vel triangulares; antherae appendix membranacea rotundata vel reniformis antheras non superans. — Species 26, late distributae.

61. **A. Juzepczukii** Pobed. sp. n.

Planta 40—60 cm alta radicibus non numerosis; caules tenues, apice volubiles, biseriatim pubescentes, in nodis circum pubescentes. Folia elliptica vel ovata tenuia 5—10 cm longa, 3—4 cm lata, apice longeattenuata, basi subcordata subtus pallide viridia, margine venisque utroque latere puberula. Petioli 3—6 mm longi, puberuli. Umbellae binae 3—5-florae, pedunculis 1—2 cm longis brevibus axillaribus erectis pubescentibus. Pedicelli pubescentes flore duplo longiores basi bracteis minimis linearibus membranaceis praediti. Flores flavido-virides, 4—5 mm in diametro lobis calycinis lanceolatis obtusis apice revolutis, subtus disperse pubescentibus, interdum subglabris; corona staminea decemloba lobis 5 brevibus obtusis subrotundatis, alternantibus 5 minoribus, membrana antherae lata subrotundata pollinia oblonga retinaculis rubris oblongis aequilonga, folliculi immaturi 4.5—5 cm longi 0.5—0.7 cm lati fusiformes glabri; semina ignota.

Habitat in fagetis montosis Tauriae.

Typus: Tauria prope m. Czatyrdagh in fagetis. 26 V 1898, leg. Golde.

Ab affini *A. Rehmannii* (Boiss.) Pobed. caulibus brevioribus 40—60 cm (nec 1—2 m); foliis minoribus, corona 4—6 mm in diametro (nec 6—7), stamina decemloba (non quinqueloba) et lobis corollae intus minus pubescentibus differt.

62. **A. stepposum** Pobed. sp. n. — *V. officinale* Ldb. Fl. Ross. III (1848) 45, p. p. non Moench. — *Cynanchum Vincetoxicum* Ldb. Fl. alt. (1829) 279, non R. Br. — *C. laxum* Kuzn. Fl. Cauc. IV, 1 (1905) 456, p. p. non Bartl.

Rhizoma breve crassum radicibus numerosis fuscis tenuibus. Caules erecti simplices vel subramosi, rotundi uni-biseriatim albo breviter pubescentes, nodis circum pubescentes. Folia ovata 3.5—8 cm longa 2.5—4.5 cm lata abrupte angustata vel apice \pm longe attenuata, basi subcordata breviter petiolata, marginibus venisque utroque latere, petiolisque puberula.

753 Umbellae axillares 2—3-florae pedunculis 2—4.5 cm longis saepius folia superantibus pedicellis floribus sesqui brevioribus, pedunculis calycibusque puberulis. Flores flavido-albi minusculi, lobi calycini lanceolati, 1.5—2 mm longi, corollae lobis oblongis apice subangustioribus margine distincte revolutis et membranaceis, corona staminea cupuliformis quinqueloba, lobis remotiusculis interdum alternantibus 2—3—5 dentibus minoribus; antherae latae, membrana lato-reniformi terminatae, retinaculum rubrum oblongum pollinibus basi subangustioribus aequilongum, folliculi lanceolati angusti, apice attenuati glabri, semina brunnea plano compressa late marginata.

Habitat in steppis et declivibus stepposis arenosisque interdum in pinetis partis Europaeae URSS et Sibiriae occidentalis.

Typus: prov. Kuibyshev, Kinel in declivibus lapidosis salti, 4 VI 1926, N. L. Desjatkin; in Herb. Inst. Bot. nom. V. Komarovii Ac. Sc. URSS conservatur.

A specie affini *A. officinali* (L.) Pobed. caulibus humilioribus erectis (non volubilibus), foliis latioribus, pedunculis folia superantibus et calyce pubescente (non glabro) diversum est.

63. *A. cretaceum* Pobed. sp. n.

Rhizoma longum rectum gemmis ex squamis lucidis obtusis obtectum radicibus; caules erecti ramosi, 20—30 cm longi biseriatim pubescentes; folia ovata acuta apice non attenuata, 2—3(4) cm longa, 0.8—1.8(2) cm lata, infima subglabra suprema lanceolata margine venisque utroque latere puberula; petioli 3—5 mm longi basi dilatati breviter pubescentes. Umbellae singulae vel binae pedunculi pubescentes axillares, 2—6-florae; bracteae lineares, 0.5—1 mm longae puberulae. Flores 6—8 mm in diametro, albi vel pallide flavi, lobis calycinis linearibus 1.5—1.8 mm longis, glabris vel subpilis, corollae lobis ovalibus obtusis 2.5—3 mm longis glabris, corona staminea quinqueloba non profunde fissa lobis triangularibus raro alternatim 1—2 obsolete lobulatis; antherae latae membrana reniformi terminatae, pollinia ovalia apice angustata, retinaculum rubrum apice dilatatum pollinio aequilongum, stigma quinquangulare planum vel subconvexum, crassum; folliculi lanceolati 0.5—0.7 cm lati apice breviter attenuati, semina subovalia 3.5—4 mm longa, 2.5—3 mm lata brunnea anguste marginata.

Habitat in declivibus montium cretaceorum, in schistosis.

Typus: prov. Voronesh, in vicinitate opp. Bobrov in monte cretaceo ad ripam dextram fl. Don 24 VII 1910, leg. V. A. Dubjanski.

Ab affini *A. officinali* (L.) Pobed. caulibus erectis humilioribus ramosis 20—30 cm lg. (nec 50—120 cm); foliis minoribus 2—3 cm lg. (nec 6—10 cm) ovalibus umbellis paucifloris differt.

64. **Sectio 2. *Rhodostegiella*** Pobed. sect. nova.—Lobi coronae membranacei, subtus et inter lobos carnosi, antherae appendix membranacea ovata apice attenuata antheris duplo longior.

Sectio monotypica: *A. sibiricum* (L.) Pobed. in Sibiria, Asia Media, Oriente extremo, Manshuria, Corea, Mongolia et China occidentalis sistens.

CYNANCHUM L.

65. ***C. stellatum*** Pobed. sp. n.—*C. acutum* auct. fl. Asiae Mediae.

Rhizoma crassum, 1.5—2 cm in diametro, lignosum, pallide griseo-flavescent; caules numerosi volubiles tenues, 1—2 mm crassi, virides vel pallide flavescentes, sparse pilosi in nodis dense pilosi. Folia ovata, 6 cm lg., 1.2—5 cm lt., apice obtuse triangularia mucronata, basi profunde cordata et auriculis munita lobis rotundatis horizontaliter dispositis marginibus venis petiolisque et subtus sparse pilosa; petioli foliis 1.5—2-plo breviores. Corymbi in numero 2—3 in uno pedunculo 2—3 cm longo vel in ramis abbreviatis dispositi pedicellis pilosis floribus duplo longioribus. Flores rosei, 4—6 mm lg.; lobis calycinis ovatis acutis pubescentibus corolla 2.5—3-plo brevioribus; lobis corollae oblongis, 4—6 mm lg.; corona staminea cupuliformis lobis 5, triangularibus acutis apice tenuiter attenuatis sine appendicibus interioribus, membrana inter lobos lata, antherae breves, earum latitudine longitudinem superante; stigma quinquangulare, pollinia aurea retinaculum superantia. Fructus ignoti. VI—VIII.

Habitat in Asia media in declivibus montium Pamiro-alaj.

Typus: Serawshan, Takfon, V 1892, V. Komarov; in Herb. Inst. Bot. nom. V. Komarovii Ac. Sc. URSS conservatur.

Nostra species affinis *Cynancho sibirico* Willd. sed coronae appendicibus interioribus deficientibus et antheris brevioribus differt.

INDEX ALPHABETICUS *

nominum specierum atque synonymorum plantarum in tomo XVIII Florae URSS commemoratarum

	Pag. **		Pag.
Acantholimon Boiss.	301	Acantholimon <i>bracteatum</i> β . <i>splendidum</i>	
" <i>acerosum</i> (Willd.) Boiss. 347		Boiss.	312
" <i>alaicum</i> Czerniak. . . 316, 732		" <i>bromifolium</i> Boiss. . . 324, 325	
" <i>alatavicum</i> Bge. 356		" <i>bromifolium</i> Czerniak. . . 323	
" " var. α . <i>typi-</i>		" <i>caryophyllaceum</i> Boiss. . 346	
" " cum Rgl. . . 356		" " var. <i>bra-</i>	
" " var. β . <i>pube-</i>		" chysta-	
" " <i>rulum</i> Bge. 360		" chyum	
" " var. β . <i>subses-</i>		Boiss. 346	
" " <i>sile</i> Herd. 356		" <i>compactum</i> Korov. . . . 322	
" " var. γ . <i>Korol-</i>		" <i>cymosum</i> O. et B.	
" " <i>kowi</i> Rgl. . . 363		Fedtsch. 311	
" <i>alatavicum</i> O. et B.		" <i>desertorum</i> Rgl. . . 357, 358	
Fedtsch. p. p. 358		" <i>diapensioides</i> Boiss. 318, 327	
" <i>Albertii</i> Rgl. 361		" <i>diapensioides</i> var. <i>longi-</i>	
" " f. <i>glabrum</i> Lincz. 361		" <i>folia</i> O. Fedtsch. . . . 317	
" <i>Alexandri</i> Fed. . . . 320, 326		" " var. O. et	
" <i>Alexeenkoanum</i> Czerniak. 316		" B. Fedtsch. 319	
" <i>araxanum</i> Bge. 345		" " Herder . . 319	
" " f. <i>microcalyx</i>		" <i>Ekatherinae</i> (B. Fedtsch.)	
Lincz. 346		Czerniak. 326	
" <i>armenum</i> Boiss. et Huet . . 347		" <i>erinaceum</i> (Jaub. et Sp.)	
" " var. <i>Balansae</i>		Lincz. 370	
Kusn. 347		" <i>erythraeum</i> Bge. 339	
" " var. <i>puberula</i>		" <i>Faustii</i> Trautv. 355	
Trautv. 347		" <i>Fetissoyii</i> Rgl. . . . 321, 326	
" " var. <i>typica</i> Tra-		" <i>Fominii</i> Kusn. 344	
utv. 347		" <i>gaudanense</i> Czerniak. . . 339	
" " β . <i>Balansae</i> Bo-		" <i>glumaceum</i> (Jaub. et Sp.)	
iss. 347		Boiss. 350	
" <i>aulieatense</i> Czerniak. . . 332		" <i>glumaceum</i> var. <i>brevisca-</i>	
" <i>avenaceum</i> Bge. 327		" pum Trautv. 350	
" " f. <i>simplicior</i>		" " var. <i>glabrum</i>	
Bornm. 327		" Lincz. . . 350	
" <i>Balansae</i> Grossh. 347		" " var. <i>sahendi-</i>	
" <i>balchanicum</i> Korov. . . . 369		" cum Kusn. . . 351	
" <i>blandum</i> Czerniak. . . . 352		" " var. <i>typica</i>	
" <i>Bobrovii</i> Czerniak. . . . 338		" Trautv. . . 350	
" <i>Bodeanum</i> Bge. 352		" <i>Gontscharovii</i> Czer-	
" <i>Borodini</i> Krassn. 317		" niak. 335, 336	
" <i>bracteatum</i> (Girard)		" <i>gramineum</i> Korov. . . . 332	
Boiss. 312		" <i>Hedinii</i> Ostenf. 317	

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** [Russian page numbers appear in the left-hand margin of the text.]

	Pag.
Acantholimon hissaricum Lincz.	335, 736
" Hohenackeri (Jaub. et Sp.)	
Boiss.	348
" " var. <i>subsessilis</i> Trautv.	356
" " β. <i>subsessile</i>	
Boiss.	348
" " γ. <i>virens</i>	
Rupr.	357
" incomptum Boiss. et Buhse	369
" Iskanderi Lipsky p. p.	313, 314
" karatavicum Pavl.	361
" Karelinii (Stschegl.) Bge.	366
" khorassanicum Czerniak.	328
" " var. <i>kopetdagense</i>	
Czerniak.	328
" Knorringianum Lincz.	364, 740
" kokandense Bge.	359
" Komarovii Czerniak.	365, 741
" Korolkovii (Rgl.) Korov.	363
" " var. <i>glabrum</i>	
Czerniak.	363
" Korovinii Czerniak.	324
" kutschanense Rech. f.	351
" langaricum O. et B.	
Fedtsch.	340
" latifolium Rupr.	322
" laxum Czerniak.	342
" lepturoides (Jaub. et Sp.)	
Boiss.	343, 345
" " var. <i>graminifolium</i> Kusn.	344
" longiflorum Lincz.	368
" lycopodioides (Girard)	
Boiss.	314
" Maewskianum Rgl.	338
" Majevianum Rgl.	338, 340
" Margaritae Korov.	333, 735
" marmoreum Korov.	321
" Mikeschinii Lincz.	323, 733
" minshelkense Pavl.	333
" mirandum Lincz.	371, 742
" mirum Lincz.	372, 743
" Munroanum Aitch. et	
Hemsl.	359
" Nikitinii Lincz.	368, 742
" nuratavicum Zakirov	334, 736
" namiricum Czerniak.	358, 738
" parviflorum Rgl.	364
" platyphyllum Czerniak.	321
" procumbens Czerniak.	331

	Pag.
Acantholimon pskemense Lincz.	325, 734
" pterostegium Bge.	311
" pulchellum Korov.	351
" " f. <i>condensatum</i> Korov.	351
" purpureum Korov.	332
" quinquelobum Bge.	367
" Raddeanum Czerniak.	355
" Roborowskii Czerniak.	317
" roseum Boiss.	370
" " var. <i>pubescens</i>	
Czerniak.	370
" " α. <i>pungens</i> Boiss.	370
" " β. <i>erinacea</i> Boiss.	370
" rubellum Boiss.	370
" Ruprechtii Bge.	321, 326
" Sackenii Bge.	357
" sahendicum Boiss. et	
Buhse	350
" saravschanicum Rgl.	336
" " var. <i>villosum</i> Lincz.	336
" schemachense Grossh.	349
" schugnanicum Czerniak.	359
" scirpinum Bge.	324
" scorpius (Jaub. et Sp.)	
Boiss.	369, 370
" setiferum Bge.	374
" splendidum Bge.	312
" squarrosum Pavl.	314
" Stocksii Boiss.	369
" strictum Czerniak.	323, 734
" Szovitsii Boiss. et Buhse	366
" talassicum Korov.	342
" tarbagataicum Gamajun.	357
" tataricum Boiss.	313
" tenuiflorum Boiss.	342
" tianschanicum Czerniak.	319
" tibeticum Hook. f. et	
Thoms.	314
" Titovii Lincz.	362, 740
" tragacanthinum (Jaub. et	
Sp.) Boiss.	369, 370
" Trautvetteri Kusn.	345
" truncatum Bge.	368
" tschimganicum Korov.	326
" Varivtzvae Czerniak.	341, 738
" velutinum Czerniak.	360, 739
" virens Czerniak.	337, 737
" " var. <i>glabrum</i> Lincz.	337
" Zaprjagaevii Lincz.	315, 732
Acerates veterana Heer	663

	Pag.		Pag.
<i>Achras theobroma</i> Schimp	474	Andromeda <i>polifolia</i> L.	74
<i>Actinocyclus secundus</i> Klotzsch	16	" " var. <i>pusilla</i> Pall.	75
<i>Aegialitis</i> R. Br.	327	" <i>polifolia</i> L.	74
<i>Alatae</i> Grossh., subsect.	630	" <i>protogaea</i> Ung.	74
<i>Aleuritia</i> Duby, sectio	112, 156	" <i>Redowskii</i> Cham. et	
" <i>cortusoides</i> Spach	130	Schlecht.	68
" <i>farinosa</i> Spach	161	" <i>revoluta</i> A. Br.	74
" <i>longiflora</i> Opiz	181	" <i>rosmarinifolia</i> Gilib.	74
<i>Alternifolia</i> DC., sect.	524	" <i>Saportana</i> Heer	74
<i>Amelia media</i> Alef.	12	" <i>Stelleriana</i> Pall.	71
" <i>minor</i> Alef.	13	" <i>taxifolia</i> Pall.	64
<i>Anagallideae</i> Rehb., tribus	275	" <i>tetragona</i> L.	68
Anagallidium Griseb.	622	" cf. <i>tremula</i> Heer	74
" <i>dichotomum</i> Griseb.	622	Andromedeae Drude, tribus	66
" <i>tetrapetalum</i> Griseb.	627	Andromedeae (Drude) E. Busch, subfam.	66
Anagallis L.	275	Androsace L.	217
" <i>arvensis</i> L.	276	" <i>acrolasia</i> Ovcz. et Vved.	229
" " ssp. <i>coerulea</i>		" <i>aflatusensis</i> Ovcz.	230
(Schreb.) Schinz et		" <i>akbaitalensis</i> Derg.	230
Keller	277	" <i>albana</i> Stev.	236
" " ssp. <i>phoenicea</i>		" " β . <i>Widemannii</i> Knuth	237
(Scop.) Schinz		" <i>altaica</i> C. Koch	227
et Keller	276	" <i>angrenica</i> Ovcz.	228, 731
" " <i>a. coeruleo flore</i> Willd.	277	" <i>angustifolia</i> B. Fedtsch.	230
" " α . <i>phoenicea</i> Ldb.	276	" <i>arctica</i> Cham. et Schlecht.	234
" " β . <i>carnea</i> Ldb.	276	" <i>armeniaca</i> Duby	237
" " β . <i>phoeniceo flore</i>		" <i>barbulata</i> Ovcz.	225, 729
Willd.	276	" " var. <i>glabrata</i> Tra-	
" " γ . <i>coerulea</i> Ldb.	277	utv.	225
" <i>carnea</i> Schrank	276	" <i>bidentata</i> C. Koch	237
" <i>coerulea</i> Schreb.	277	" <i>bryomorpha</i> Lipsky	234
" <i>latifolia</i> L.	276	" <i>Bungeana</i> Schischk. et Bobr.	231
" " C. A. M.	277	" <i>caduca</i> Ovcz.	222
" <i>Monelli</i> L.	278	" <i>caespitosa</i> Knuth	233
" " <i>verticillata</i>	278	" <i>capitata</i> Willd.	229
" <i>phoenicea</i> Scop.	276	" <i>caucasica</i> Somm. et Lev.	238
" " var. <i>carnea</i> C. Koch	276	" <i>chamaejasme</i> Knuth	231
" <i>tenella</i> L.	278	" <i>Chamaejasme</i> Ldb.	232
<i>Andraspis</i> Duby, p. p.	235, 236	" <i>chamaejasme</i> Mertens	229
<i>Andraspis</i> (Duby) C. Koch, sectio	236	" <i>chamaejasme</i> var. <i>hirtifolia</i>	
Andromeda L.	74	Rupr.	230
" <i>bryantha</i> L.	66	" " " <i>triflora</i>	
" <i>Bryanthus</i> Pall.	66	Knuth	232
" <i>calyculata</i> L.	76	" " f. <i>angustifolia</i>	
" <i>coerulea</i> L.	64	Rgl. et Fedtsch.	230
" <i>columellaris</i> Fisch.	68	" <i>darvasica</i> Ovcz.	230
" <i>ericoides</i> Pall.	69	" <i>dasyphylla</i> Bge.	227
" <i>grandiflora</i> hort.	74	" <i>elongata</i> L.	239
" <i>hypnoides</i> L.	70	" <i>farinosa</i> Spreng.	161
" <i>kuschkenensis</i> Vasil.	74	" <i>Fedtschenkoii</i> Ovcz.	240
" <i>lycopodioides</i> Pall.	67	" <i>filiformis</i> Retz.	241
" <i>nana</i> Maxim.	72	" <i>Friesii</i> Trautv.	232

	Pag.
Androsace Gmelini (Gaertn.) Roem. et	
Schult.	235
" <i>incana</i> Lam.	225
" <i>intermedia</i> Ldb.	238
" <i>Koso-Poljanskii</i> Ovcz.	227, 730
" <i>lactiflora</i> Pall.	239
" <i>Lehmanniana</i> Hand.-Mztt.	231
" " Hult.	229
" <i>Lehmanniana</i> Spreng.	232
" <i>longifolia</i> C. Koch	237
" <i>longiscapa</i> C. Koch	232
" <i>macrantha</i> Boiss. et Hult.	238
" <i>maxima</i> auct.	242
" " <i>var. caucasica</i> Kusn.	242
" <i>maxima</i> <i>var. sibirica</i> Petunn.	242
" " <i>var. Turczaninovii</i>	
Kusn.	242
" <i>neglecta</i> Clerc	241
" <i>ochotensis</i> Willd.	233
" " <i>var. arctica</i> Kurtz	234
" <i>Olgae</i> Ovcz.	230
" <i>Ovczinnikovii</i> Schischk. et	
Bobr.	221, 729
" <i>pleioscapa</i> C. Koch	237
" <i>primuloides</i> Moench	130, 248
" <i>Raddeana</i> Somm. et Lev.	238
" <i>saxifraga</i> Bge.	235
" <i>septentrionalis</i> L.	240
" " <i>var. brevis-</i>	
<i>capa</i> Kryl.	240
" " <i>var. ciliata</i>	
Trautv.	232
" " <i>var. lacti-</i>	
<i>flora</i>	
Tra-	
utv.	239
" " <i>f. nana</i>	
Derganc	240
" <i>sericea</i> Ovcz.	221, 729
" <i>taurica</i> Ovcz.	226, 227, 730
" <i>triflora</i> Adams	232
" <i>tschuktschorum</i> Knuth	233
" <i>Turczaninovii</i> Freyn	242
" " <i>var. grandi-</i>	
<i>flora</i> Bge.	242
" <i>umbellata</i> (Lour.) Merr.	235
" <i>valerianoides</i> Lehm. ex	
Spreng.	236
" <i>Vegae</i> Knuth	233
" <i>villosa</i> Bge.	221
" " <i>Turcz. var.</i>	225
" " <i>auct.</i>	221, 225, 226, 227

	Pag.
Androsace villosa var. <i>dasyphylla</i>	
Knuth	227
" " <i>var. incana</i> Duby	225
" " <i>var. latifolia</i> Bge.	231
" " <i>var. Turczaninovii</i>	
Freyn	225
" <i>Wiedemannii</i> Boiss.	237
Anthodendron flavum Rehb.	57
" <i>ponticum</i> Rehb.	57
Antitoxicum Pobed.	674
" <i>acuminatum</i> (Dcne.) Pobed.	706
" <i>Albovianum</i> (Kusn.) Pobed.	694
" <i>amplexicaule</i> (Sieb. et	
Zucc.) Pobed.	705
" <i>atratum</i> (Bge.) Pobed.	704
" <i>Boissieri</i> (Kusn.) Pobed.	680
" <i>canescens</i> (Willd.) Pobed.	694
" <i>cretaceum</i> Pobed.	702, 753
" <i>darvasicum</i> (B. Fedtsch.)	
Pobed.	693
" <i>funebre</i> (Boiss. et Ky.)	
Pobed.	691, 692
" <i>Huteri</i> (Vas. et Aschers.)	
Pobed.	680, 684
" <i>inamoenum</i> (Maxim.)	
Pobed.	707
" <i>intermedium</i> (Taliev)	
Pobed.	689
" <i>jailicola</i> (Juz.) Pobed.	696
" <i>Juzepeczukii</i> Pobed.	683, 752
" <i>laxum</i> (Bartl.) Pobed.	692, 701
" <i>maeoticum</i> (Kleop.) Pobed.	687
" <i>medium</i> (Dcne.) Pobed.	681
" <i>minus</i> (C. Koch) Pobed.	687
" <i>mugodsharicum</i> Pobed.	690
" <i>nigrum</i> (Moench) Pobed.	680
" <i>officinale</i> (Moench) Pobed.	697
" <i>pumilum</i> (Dcne.) Pobed.	692
" <i>Raddeanum</i> (Alb.) Pobed.	695
" <i>Rehmanni</i> (Boiss.)	
Pobed.	682, 684, 692
" <i>rossicum</i> (Kleop.) Pobed.	690
" <i>scandens</i> (Somm. et Lev.)	
Pobed.	680, 692
" <i>Schmalhauseni</i> (Kusn.)	
Pobed.	684, 687, 692
" <i>sibiricum</i> (L.) Pobed.	707
" " <i>var. australe</i>	
Maxim.	708
" " <i>var. boreale</i>	
Maxim.	708
" <i>stauroplitanum</i> Pobed.	695

	Pag.		Pag.
Asclepias <i>curassavica</i> L.	671	Bryonanthe Smoljan., sectio	209, 728
" <i>davurica</i> Willd.	709	Bumelia <i>minor</i> Ung.	474
" <i>dubia</i> Oliv.	704	" <i>oreadum</i> Ung.	474
" <i>fruticosa</i> L.	668	" <i>subplejadum</i> Stanisl.	474
" <i>nigra</i> M. B.	680, 691	Bumelioides Endl., subsectio	492
" <i>paniculata</i> Bge.	671	Bumelioides (Endl.) V. Vassil., sect.	492
" <i>purpurascens</i> Georgi	709	Callianthae Pax, sectio	189
" <i>purpurea</i> Pall.	709	Calluna Salisb.	88
" <i>sibirica</i> L.	707	" <i>atlantica</i> Seem.	89
" <i>syriaca</i> L.	670	" <i>erica</i> DC.	89
" <i>Vincetoxicum</i> L.	698	" <i>sagittaeifolia</i> S. F. Gray	89
" " Pall.	701	" <i>vulgaris</i> (L.) Hill.	88
Asmothamnus <i>pallidus</i> Krasn.	43	" " f. <i>alba</i> Don	89
Asterolinon Hoffmsg. et Link	272	Carolinella Hemsl.	133
" <i>linum-stellatum</i> (L.) Hoffmsg. et Link	272	Carolinella (Hemsl.) Pax, sectio	133
Auriculatae Pax., p. p.	182	" <i>cordifolia</i> Hemsl.	133
" W. W. Sm. et Fletch., subsectio	182	Cassandra D. Don	75
Auriculatum Schwz., sectio	281, 282	" <i>calyculata</i> D. Don	76
Azalea L. p. p.	55, 57	" <i>dahurica</i> Grum-Crzhim. et Semen.	76
" <i>caucasica</i> Kuntze	39	Cassiope D. Don	66
" <i>flava</i> Hoffmsg.	57	" <i>ericoides</i> (Pall.) D. Don	69
" <i>fragrans</i> Adams	43	" <i>hypnoides</i> D. Don	70
" <i>lancifolia</i> Kuntze	34	" " Hook.	70
" <i>lapponica</i> L.	46	" <i>lycopodioides</i> (Pall.) D. Don	67
" " Pall.	45	" <i>oxycoccoides</i> A. Gray	72
" <i>pallida</i> Turcz.	43	" <i>Redowskii</i> (Cham. et Schlechtd.) G. Don	68
" <i>parvifolia</i> Kuntze	45	" <i>Stelleriana</i> DC.	71
" <i>pontica</i> L.	57	" <i>tetragona</i> (L.) D. Don	68
" " var. <i>autumnalis</i> C. Koch	57	Catharanthus G. Don	646
" <i>procumbens</i> L.	63	Centaurium Gilib.	527
" <i>Schlippenbachii</i> Kuntze	56	" <i>Meyeri</i> (Bge.) Druce	529
" <i>Tschonoskii</i> Kuntze	55	" " f. <i>pumilum</i> Kusn.	529
Baccatae Mansf., sect.	522	" <i>pulchellum</i> (Swartz) Druce	528
Blackstonia Huds.	535	" " var. <i>altaicum</i> Kit. et Hara	529
" <i>perfoliata</i> (L.) Huds.	536	" " var. <i>ramosissimum</i> Gilmour	528
Botryostegae Stapf	26	" " f. <i>pseudocapitatum</i> Grossh.	528
" <i>bracteata</i> (Maxim.) Stapf	26	" " f. <i>pumilum</i> Kusn.	528
Breviglandium Dulac	252	" <i>spicatum</i> (L.) Fritsch	535
" <i>palustre</i> Dulac	252	" <i>tenuiflorum</i> (Hoffmsg. et Link) Fritsch	530
Bruckenthalia Rehb.	92	" <i>turcicum</i> (Vel.) Druce	533
" <i>spiculifolia</i> (Salisb.) Rehb.	92	" <i>uliginosum</i> (W. et K.) Beck.	534
Bryanthus Stell.	65	" <i>umbellatum</i> Gilib.	533
" <i>aleuticus</i> A. Gray	65	" <i>vulgare</i> Raf.	533
" <i>coeruleus</i> Dippel	64	Centunculus L.	278
" <i>Gmelini</i> D. Don	66	" <i>minimus</i> L.	278
" <i>musciiformis</i> Nakai	66		
" <i>taxifolius</i> Gray	64		

	Pag.		Pag.
Cephalorrhizum M. Pop. et Korov.	405	Cortusa <i>Matthioli</i> Podpera	129
" <i>oopodium</i> M. Pop. et		" " Turcz.	247
Korov.	406	" " Vved.	245
" <i>setiferum</i> M. Pop. et		" " auct.	244
Korov.	374	" " ssp. <i>Semenovi</i> Vved.	207
" <i>turcomanicum</i> M.		" " var. <i>chinensis</i> Al.	
Pop.	407, 746	Richter	244
Ceratostigma <i>plumbaginoides</i> Bge.	296	" " var. <i>Semenovii</i>	
Chaetolimon Bge., sect.	372	B. Fedtsch.	207
Chaetolimon (Bge.) Lincz.	372	" " var. <i>sibirica</i> Sagorsky	
" <i>limbatum</i> Lincz.	375	et Schneid.	248
" <i>setiferum</i> (Bge.) Lincz.	374	" " f. <i>Brotheri</i> (Pax)	
" <i>sogdianum</i> Lincz.	373	Knuth	245
Chamaecallis Schott, sectio	201	" " f. <i>pekinensis</i> Al. Rich-	
Chamaecistus <i>kamtschaticus</i> Rgl.	59	ter	244
" <i>procumbens</i> Kuntze	63	" " f. <i>sibirica</i> Podpera	248
Chamaedaphne Moench	75	" <i>mongolica</i> A. Los.	247
" <i>calyculata</i> (L.) Moench	76	" <i>pekinensis</i> Kom. et Aliss.	244
" <i>calyculata nana</i> L. o d d.	75	" <i>pekinensis</i> (Al. Richter) A. Los.	244
" <i>calyculata</i> var. <i>nana</i>		" <i>sachalinensis</i> A. Los.	244
(Lodd.) E. Busch	76	" <i>Semenovi</i> Herd.	207
Chamaejasme C. Koch, sectio	221	" " Krassn.	207
Chamaejasmoideae Hand.-Mzt., subsec-		" <i>sibirica</i> Andrz.	247
tio	229	" <i>sibirica</i> Baenitz	248
Chamaeledon <i>procumbens</i> Link	63	" " Borbas	247
Chimaphila Pursh	17	" <i>sulphurea</i> Semenov	207
" <i>astyla</i> Maxim.	18	" <i>turkestanica</i> A. Los.	245
" <i>japonica</i> Miquel	18	Cortusoides Balf., sectio	124
" <i>maculata</i> (L.) Pursh	19	Crawfordia Wall.	536
" <i>umbellata</i> (L.) Nutt.	17	" <i>japonica</i> Sieb. et Zucc.	537
Chironia <i>uliginosa</i> W. et K.	534	" <i>pterygocalyx</i> Hemsley	537
Chlora L.	535	" <i>volubilis</i> (Maxim.) Makino	537
" <i>perfoliata</i> Willd.	536	Crossopetalum Froel., sectio	590
Chomutowia B. Fedtsch.	327	Crystallaphlomis Rupr., sectio	190
" <i>Ekatherinae</i> B. Fedtsch.	326	Cyanococcus A. Gray, sectio	95
Chondrophylla Bge., sectio	570	Cyclamen L.	279
Cilicina F. W. Klatt, sectio	259	" <i>abchasicum</i> (Medw.) Kolak.	288
Cladothamnus Bong.	27	" " var. <i>albiflora</i>	
" <i>pyroliflorus</i> Bong.	27	Kolak.	289
Coelanthé DC., sectio	539	" " var. <i>albobaculata</i>	
Comastoma Wettst., sectio	613	Kolak.	289
Cortusa L.	242	" " var. <i>nervosa</i> Ko-	
" <i>altaica</i> A. Los.	246	lak.	289
" <i>amurensis</i> Fed.	246, 731	" " var. <i>purpurea</i>	
" <i>Brotheri</i> Pax	245	Kolak.	289
" <i>Gmelini</i> Gaertn.	236	" " var. <i>rosea</i>	
" <i>himalaica</i> A. Los.	245	Kolak.	289
" <i>jakutica</i> A. Los.	247	" <i>adsharicum</i> Pobed.	288
" <i>Matthioli</i> Bge.	247	" <i>africanum</i>	282
" " Hook.	245	" <i>bzybicum</i> Pobed.	286
" <i>Matthioli</i> L.	248	" <i>calcareum</i> Kolak.	288, 289
" <i>Matthioli</i> Lipsky	207	" <i>caucasicum</i> Willd.	287

	Pag.		Pag.
Cyclamen circassicum Pobed.	285	Cynanchum atratum Bge.	704
" <i>coum</i> Beket.	287	" <i>Boissieri</i> Kusn.	680
" " Kusn.	288	" <i>caudatum</i> Maxim.	717
" <i>coum</i> Mill.	280, 286, 289	" <i>funebre</i> Kusn.	691
" <i>coum</i> Schmalh.	288	" <i>inamoenum</i> Loes.	707
" " var. <i>abchasicum</i> Medw.	288	" <i>intermedium</i> Kleop.	689
" " var. <i>grandiflorum</i>		" <i>Kuznetzowii</i> E. Bordz.	687
Steup.	285	" <i>laxum</i> Bartl.	701
" " var. <i>ibericum</i> Kusn.	288	" " Kusn.	702
" " var. <i>ibericum</i> Boiss.	287	" " auct.	697, 702
" " β. <i>ibericum</i> Boiss.	290	" <i>longifolium</i> Dcne.	716
" <i>elegans</i> Boiss. et Buhse	289	" Mart.	715
" <i>europaeum</i> Kusn.	281	" <i>maeoticum</i> Kleop.	687
" <i>europaeum</i> L.	280, 282	" <i>Maximoviczii</i> Pobed.	717
" <i>europaeum</i> Ldb.	288	" <i>minus</i> C. Koch	687
" " M. B.	287	" <i>monspeliacum</i> L.	715
" " Pall.	286	" <i>nigrum</i> C. A. M.	680
" " ssp. <i>ponticum</i>		" <i>pumilum</i> Bornm.	692
(Alb.) Schwarz 281, 282		" <i>purpureum</i> (Pall.) R. Schum.	709
" " var. <i>colchicum</i>		" <i>Raddeanum</i> Kusn.	695
Alb.	281	" <i>Rehmanni</i> Kusn.	682
" " α. <i>typicum</i> Alb.	281	" <i>roseum</i> R. Br.	709
" " β. <i>ponticum</i> Alb.	281	" <i>rossicum</i> Kleop.	690
" <i>ibericum</i> Stev.	287	" <i>scandens</i> Kusn.	680
" <i>neapolitanum</i>	282	" <i>Schmalhauseni</i> Kusn.	684
" <i>orbiculatum</i> Doorenb.	287, 290	" auct.	687
" " var. <i>coum</i> Doorenb.	286	" <i>sibiricum</i> R. Br.	708
" " " f. <i>album</i> Doorenb.	288	" " Willd.	716
" <i>parviflorum</i> Pobed.	285	" <i>stellatum</i> Pobed.	717, 754
" <i>persicum</i> Mill.	280	" <i>Vincetoxicum</i> C. A. M.	701
" <i>ponticum</i> (Alb.) Pobed.	281, 282	" Ldb.	702
" <i>vernale</i> C. Koch	287	" β. <i>laxum</i> Ar-	
" <i>vernum</i> Glas.	290	cangeli	701
" <i>vernum</i> Sweet	280, 287	" <i>volubile</i> Hemsley	703
Cyclamineae (Rchb.) Pax, tribus	279	Cynoctonum E. Mey.	709
Cyclostigma Griseb., sect.	584	" <i>purpureum</i> (Pall.) Pobed.	709
Cynanchinae K. Schum., tribus	672	" <i>roseum</i> Dcne.	709
Cynanchoideae K. Schum., subfam.	666	" <i>Wilfordi</i> Maxim.	713
Cynanchum L.	674, 714	Daphnidostaphylis Fendleriana Klotzch	76
" <i>acuminatifolium</i> Hemsl.	706	Dasyphyllae Ovcz. subsectio	227
" <i>acutum</i> L.	715	Diapensia L.	105
" " var. <i>macrophyllum</i>		" <i>japonica</i> F. Gmel.	106
Grossh.	716	" <i>lapponica</i> L.	106
" " var. <i>longifolium</i>		" " var. <i>asiatica</i> Herd.	106
Grossh.	715	" " var. <i>genuina</i>	
" <i>acutum</i> Ldb.	716	E. Busch	106
" " β. <i>longifolium</i> Ldb.	716	" " var. <i>obovata</i> Fr.	
" " auct.	717	Schmidt	106
" <i>Albovianum</i> Kusn.	694	" <i>obovata</i> (Fr. Schmidt) Nakai	106
" <i>amplexicaule</i> Hemsl.	705	" <i>obtusifolia</i> Salisb.	106
		Diapensiaceae Lindl.	105

	Pag.
Dionysia Fenzl.	208
" <i>Bornmülleri</i> Strauss	214
" <i>hissarica</i> Lipsky	213, 214
" <i>involucrata</i> Zapr.	214
" <i>Kossinskyi</i> Czerniak.	210
" <i>tapetodes</i> Bge.	209, 213
<i>Dionysiastrum</i> Smoljan., sectio	214, 728
<i>Dionysiopsis</i> Pax, sectio	213
<i>Dionysiopsis</i> (Pax) Smoljan., sec- tio	213, 214, 728
Diospyros L.	475
" <i>anceps</i> Heer	476
" <i>brachysepala</i> A. Br.	476
" <i>chinensis</i> Blume	477
" <i>ciliata</i> Raf.	482
" <i>ficoides</i> Lesq.	476
" <i>kaki</i> L.	477
" <i>Kaki</i> var. <i>glabra</i> DC.	481
" <i>lotoides</i> Ung.	476
" <i>lotus</i> L.	481
" <i>lotus</i> L.	476
" <i>paradisiaca</i> Ett.	476
" <i>primaeva</i> Heer	476
" <i>pubescens</i> Pursh.	482
" <i>Schi-tse</i> Bge.	477
" <i>virginiana</i> L.	482
" sp.	476
Dodecatheon L.	290
" <i>frigidum</i> Cham. et Schlecht.	291
" <i>Meadia</i> L.	291
<i>Drosera umbellata</i> Laur.	235
Ebenaceae Vent.	475
Ebenales Engl., ordo	474
Echitoideae K. Schum., subfam.	652
<i>Echitonium cuspidatum</i> Heer	645
" <i>Schischkinii</i> M e x e d l.	645
" sp.	645
<i>Elliotia bracteata</i> Hook.	26
<i>Endotricha</i> Froel., sect.	598
<i>Endotropis auriculata</i> Franch. et Sav.	713
" <i>caudata</i> Miq.	717
<i>Ephemeram</i> Rchb.	263
<i>Ephemerum</i> (Rchb.) Endl., sectio	263
Epigaea L.	77
" <i>asiatica</i> Maxim.	77
" <i>gaultherioides</i> (Boiss. et Bal.) Takht.	77
" <i>repens</i> L.	77
Erica L.	89
" <i>arborea</i> L.	91

	Pag.
Erica <i>baccans</i> L.	91
" <i>botuliformis</i> Salisb.	90
" <i>Bruckenthalii</i> Sprengl.	93
" <i>bryantha</i> Thunb.	66
" <i>carnea</i> L.	91
" <i>coerulea</i> Willd.	64
" <i>glabra</i> Gilib.	89
" <i>herbacea</i> L.	91
" <i>lycopodioides</i> Waitz	67
" <i>olympica</i> Sibth.	93
" <i>spiculifolia</i> Salisb.	92
" <i>Stelleriana</i> Willd.	71
" <i>tetralix</i> L.	90
" " f. <i>alba</i> Rgl.	91
" <i>vulgaris</i> L.	89
Ericaceae DC.	22
Ericales Lindl., ordo	7
Ericoideae Drude, subfam.	88
<i>Ericoides arboreum</i> Kuntze	91
" <i>tetralix</i> Kuntze	90
Eubotryoides (Nakai) Hara	72
" Grayana (Maxim.) Hara	73
" Tshonoskii (Maxim.) Po- jark.	43
Erythraea Renealm	527
" <i>candelabrum</i> H. Lindb.	528
" <i>caspica</i> Fisch.	528
" <i>centaurium</i> Pers.	533
" <i>latifolia</i> Boiss.	530
" <i>lineariaefolia</i> Pers.	533
" <i>Meyeri</i> Bge.	529
" <i>pulchella</i> Horn.	528
" " var. <i>altaica</i> Kitag.	529
" " " <i>albiflora</i> Ldb.	529
" <i>ramosissima</i> M. B.	529
" " Pers.	528
" " var. <i>altaica</i> Griseb.	529
" " var. <i>Meyeri</i> (Bge.) Kusn.	529
" var. <i>pulchella</i> (Fr.) Griseb.	528
" " var. <i>albiflora</i> Boiss.	529
" <i>spicata</i> Pers.	535
" <i>tenuiflora</i> Hoffmsg. et Link	530
" <i>turcica</i> Vel.	533
" <i>uliginosa</i> Host	534
Erythraeinae Gilg., tribus	527
Erythrostoma Bge., subsect.	369
<i>Esquirolia</i> Lév.	518
Euantitoxicum Pobed., sectio	680, 752

	Pag.		Pag.
<i>Euerythraea</i> Griseb., sectio	528	<i>Fraxinus nigra</i> var. <i>mandschurica</i> (Rupr.)	
<i>Eugentiana</i> Kusn., subgen.	539	Lingelsh.	492
<i>Eulimoniam</i> Pax, sectio	436	" <i>ornus</i> L.	488
<i>Euolaea</i> DC., sectio	513	" <i>Ornus</i> L.	486
<i>Euornus</i> Koehne et Lingelsh., subsect. 488		" <i>oxycarpa</i> Willd.	499
<i>Euornus</i> (Koehne et Lingelsh.) V. Vas-		" " var. <i>angustifolia</i>	
sil., sectio	488	(Vahl) Lingelsh.	500
<i>Euprimula</i> Schott, sectio	185	" " var. <i>australis</i> (Gay)	
<i>Eurhododendron</i> DC., sectio	35	Lingelsh.	500
<i>Eurystoma</i> Bge., subsectio	369	" " var. <i>oligophylla</i> Wen-	
<i>Eurystoma</i> Bge. em. Boiss., subsectio . 369		zig	500
<i>Eurystomata</i> Boiss., subsectio	369	" " var. <i>oxyphylla</i> (M. B.)	
<i>Euvaccinium</i> A. Gray, sectio	96	Lingelsh.	500
<i>Farinosae</i> Pax, sect.	156, 182	" " var. <i>rostrata</i> (Guss.)	
<i>Fauria</i> Franch.	641	C. Koch	500
" <i>crista galli</i> (Menz.) Makino	641	" " var. <i>sogdiana</i> Wen-	
" <i>japonica</i> Franch.	641	zig	498
<i>Floribundae</i> Pax, sect.	214	" <i>oxyphylla</i> M. B.	499, 500
<i>Fraxinaster</i> DC., sect.	490	var. <i>oligophylla</i>	
<i>Fraxinaster</i> (DC.) V. Vassil., subgen. 490		Boiss.	500
<i>Fraxinus</i> L.	485	" <i>Pallisae</i> Willm.	497
" <i>americana</i> L.	491	" <i>parviflora</i> Lam.	502
" " ssp. <i>pennsylvanica</i>		" <i>pennsylvanica</i> Marsh.	491
Waesmael	491	" " var. <i>lanceolata</i>	
var. <i>juglandifolia</i>		Sarg.	490
Rehd.	492	" " var. <i>viridis</i>	
" <i>angustifolia</i> Vahl	500	(Mchx.) C. K.	
" <i>chinensis</i> Roxb.	489	Schn.	491
" " var. <i>rhynchophylla</i>		" cf. <i>pennsylvanica</i> Marsh.	486
Hemsl.	489	" <i>Pojarkoviana</i> V. Vassil.	501, 750
" <i>cilicica</i> Lingelsh.	488	" <i>potamophila</i> Herd.	499, 502
" <i>concolor</i> Mühl.	490	" Rgl.	498
" <i>coriariifolia</i> Scheele	496, 498	" <i>pubescens</i> Lam.	491
" <i>epiptera</i> Mchx.	492	" <i>raibocarpa</i> Rgl.	489
" <i>excelsior</i> L.	495	" <i>Regelii</i> Dippel	502
" " ssp. <i>angustifolia</i>		" <i>rhynchophylla</i> Hance	489
(Vahl) Wesmael	500	" <i>rostrata</i> Guss.	500
" " ssp. 2. <i>oxycarpa</i>		" <i>Sargentiana</i> Lingelsh.	489
Wesmael	499	" <i>sogdiana</i> Bge.	502
" " var. <i>coriariaefolia</i>		" <i>sogdiana</i> Dippel	498
Boiss.	496	" <i>syriaca</i> Boiss.	498
" " var. <i>monophylla</i> Dipp. 495		" <i>taurica</i> hort.	499
" <i>excelsior</i> L.	486	" <i>turkestanica</i> Carr.	498
" ? <i>excelsissima</i> Koidz.	492	" <i>viridis</i> Mchx.	491
" <i>holotricha</i> Koehne	497, 498, 502	" <i>yukonensis</i> Holl.	486
" <i>holotricha</i> Prodan	497	" <i>yunnanensis</i> Lingelsh.	489
" <i>juglandifolia</i> Lam.	491	<i>Fraxinus</i> sp.	486
" <i>juglandina</i> S a p.	486	<i>Frigida</i> Kusn., sect.	556
" <i>Kotschyi</i> C. K. Schn.	488	<i>Gaultheria</i> L.	78
" <i>lanceolata</i> Borkh.	490	" <i>Miqueliana</i> Takeda	78
" <i>mandschurica</i> Rupr.	492	" <i>pyroloides</i> Hook. f. et Thoms.	78

	Pag.		Pag.
Gaultherieae (Drude) E. Busch, subfam.	78	<i>Gentiana aurea</i> var. <i>typica</i> Kusn.	611
<i>Gautiera jezoensis</i> Sieb.	73	" " <i>α. borealis</i> Kryl.	611
<i>Gentiana</i> L.	538	" " <i>β. umbellata</i> Kryl.	610
" <i>acaulis</i> ssp. 1. <i>Clusii</i> Kusn.	583	" " <i>β. umbellata</i> Kusn.	611
" " ssp. 2. <i>excisa</i> Kusn.	583	" " <i>γ. tenuis</i> Kryl.	610
" <i>acuta</i> Mchx.	607	" <i>auriculata</i> Pall.	601
" <i>adscendens</i> Pall.	562	" " f. <i>albo-coerulea</i>	
" <i>aggregata</i> Bge.	610	" " V. Vass.	601
" <i>ajanensis</i> Murb.	607	" " f. <i>pumila</i> V. Vass.	601
" <i>algida</i> Pall.	559	" " f. <i>simplicior</i> V. Vass.	601
" " <i>α. sibirica</i> Turcz.	559	" <i>axillaris</i> (F. M. Schmidt)	
" " <i>β. Romanzowii</i> Kusn.	560	" Murb.	606
" " <i>γ. frigida</i> Kusn.	560	" <i>axilliflora</i> Lévl. et Vnt.	549
" <i>altaica</i> Pall.	572	" <i>azurea</i> Bge.	613
" <i>Amarella</i> L. p.p.	605, 606	" <i>baltica</i> Murb.	599
" " var. <i>lingulata</i>		" <i>barbata</i> Fedtsch. p.p.	597
" " Kryl.	605	" <i>barbata</i> Froel.	595
" " <i>β. pyramidalis</i>		" <i>barbata</i> var. <i>genuina</i> Kryl.	595
" " Ldb.	602, 606	" " var. <i>simplex</i> Kryl.	595
" " <i>γ. axillaris</i> Ldb.	606	" " <i>β. simplex</i> Bge.	595
" " <i>δ. livanica</i> Ldb.	605	" " f. <i>genuina</i> Kryl.	595
" " <i>ε. obtusifolia</i>		" " f. <i>simplex</i> Bge.	595
" " Ldb.	602	" <i>berezovcaea</i> Prodan	579
" " <i>ζ. uliginosa</i> Ldb.	605	" <i>Biebersteinii</i> Bge.	601
" <i>angulosa</i> Kryl.	585	" " f. <i>atrata</i> Kusn.	601
" <i>angulosa</i> M. B.	585	" " f. <i>Buschiana</i> Kusn.	601
" <i>aquatica</i> Clarke	579	" " f. <i>papillosa</i>	
" <i>aquatica</i> L.	579	" " Grossh.	602
" <i>aquatica</i> Ldb.	580	" " f. <i>pseudobulgarica</i>	
" " M. B.	581	" " Kusn.	601
" " ssp. <i>alba</i> Freyn	579	" " f. <i>typica</i> Kusn.	601
" <i>arctica</i> Grossh.	588	" <i>blepharophora</i> E. Bordz.	592
" <i>asclepiadea</i> L.	543	" <i>bucovinensis</i> Herbl.	589
" " var. <i>macrocalyx</i>		" <i>campestris</i> L.	600
" " Somm. et Lev.	543	" " ssp. <i>germanica</i>	
" " var. <i>schistocalyx</i>		" " Froel.	601
" " Grossh.	543	" " ssp. <i>suecica</i> Froel.	601
" " f. <i>albiflora</i> Murr.	543	" <i>carpatica</i> Wettst.	603
" " f. <i>cruciata</i> Wartm.		" <i>carpaticola</i> Borb.	603
" " et Schlatt.	543	" <i>caucasica</i> Lodd.	604
" " f. <i>pectinata</i> Wartm.		" <i>caucasica</i> M. B.	603
" " et Schlatt.	543	" " var. <i>coerulescens</i>	
" " f. <i>ramosa</i> Züscher	543	" " Trautv.	603
" <i>asclepiadea</i> M. B.	543	" " var. <i>flavescens</i>	
" <i>atrata</i> Bge.	610	" " Trautv.	603
" <i>aurea</i> Boiss.	611	" " var. <i>Marcowiczii</i>	
" <i>aurea</i> L.	611	" " Kusn.	604
" <i>aurea</i> Ldb. p.p.	610, 612	" <i>Centaurium</i> L.	528, 533
" <i>aurea</i> var. <i>glomerata</i> Kusn.	610	" " <i>β. L.</i>	533
" <i>aurea</i> var. <i>involverata</i> (Rottb.)		" <i>chrysoneura</i> Exstam et Murb.	618
" " Kusn.	611	" <i>ciliata</i> Kryl.	592
" " var. <i>sibirica</i> Kusn.	612	" <i>ciliata</i> L.	591

	Pag.
<i>Gentiana ciliata</i> M. B.	592
" " <i>β. fimbriata</i> C. Koch.	592
" " <i>β. humilis</i> Griseb.	
p.p.	591, 592
" " <i>f. multiflora</i> Gaud.	591
" <i>Clusii</i> Perr. et Song.	583
" <i>cordifolia</i> C. Koch	551
" <i>cruciata</i> Kusn.	555
" <i>cruciata</i> L.	568
" <i>cruciata β. phlogifolia</i> Kusn.	569
" " <i>γ. depressa</i> Kusn.	569
" <i>dahurica</i> Fisch.	566
" <i>dahurica</i> Kar. et Kir.	570
" <i>Dechyana</i> Somm. et Lev.	619
" " <i>f. perpusilla</i> Grossh.	619
" <i>decumbens</i> L.	562
" <i>decumbens</i> Ldb.	566
" " <i>var. Gebleri</i> Kryl.	562
" " " <i>Pallasii</i> Kryl.	562
" <i>depressa</i> Schur	569
" <i>detonsa</i> Kom.	596
" <i>detonsa</i> Rottb.	596
" <i>dichotoma</i> Pall.	617
" <i>diluta</i> Turcz.	626
" <i>djmilensis</i> C. Koch	575
" <i>Doluchanovii</i> Grossh.	592
" <i>dshungarica</i> Rgl.	550
" <i>excisa</i> Presl.	583
" <i>falcata</i> Turcz.	617
" " <i>f. pusilla</i> Grossh.	617
" <i>Fetissowi</i> Rgl. et Wimmel.	567
" <i>fimbriaeplica</i> C. Koch	550
" <i>Fischeri</i> P. Smirn.	549
" <i>Fortunei</i> Hook.	544
" <i>frigida</i> Haenke	560
" " <i>α. genuina</i> Ldb.	560
" <i>frigida β. Romanzowii</i> Ldb.	559
" " <i>γ. algida</i> Ldb.	559
" <i>Gebleri</i> Fisch.	549
" " Ldb.	562
" <i>gelida</i> M. B.	555
" <i>glauca</i> Pall.	561
" <i>glomerata</i> Kusn.	563
" <i>grandiflora</i> Laxm.	572
" <i>Grombezewskii</i> Kusn.	564
" <i>Grossheimii</i> Doluch.	552
" <i>humilis</i> Stev.	579
" <i>jakutensis</i> Bge.	567
" <i>japonica</i> Maxim.	582
" <i>Karelini</i> Griseb.	578
" <i>Kaufmanniana</i> Rgl. et	
Schmalh.	565

	Pag.
<i>Gentiana Kesselringi</i> Rgl.	565
" <i>Kirilowii</i> Turcz.	563
" <i>Kochiana</i> Perr. et Song.	583
" <i>Kolakovskyi</i> Doluch.	552
" " <i>var. bzybica</i>	
Doluch.	553
" " <i>f. latifolia</i> (Alb.)	
Grossh.	553
" <i>Komarovii</i> Grossh.	596
" " <i>f. pumila</i> Grossh.	596
" <i>Krylovii</i> Grossh.	585
" <i>kurilensis</i> Grossh.	576, 750
" <i>laciniata</i> Kit.	572
" <i>lagodechiana</i> (Kusn.) Grossh.	559
" <i>lanceifolia</i> Raf.	605
" <i>leucomelaena</i> Maxim.	578
" " <i>var. alba</i> Kusn.	578
" " <i>α. genuina</i> Kryl.	579
" " <i>β. pusilla</i> Kryl.	579
" " <i>f. alba</i> Turcz.	579
" <i>lingulata</i> Agardh	605
" " <i>var. livonica</i> Eschsch.	606
" <i>Lipskyi</i> Kusn.	604
" <i>livonica</i> Eschsch.	606
" <i>longipes</i> Turcz.	578
" <i>lutea</i> L.	540
" <i>macrophylla</i> Pall.	567
" " <i>β. minor</i> Ldb.	567
" <i>Makinoi</i> Kusn.	548
" <i>Marcowiczii</i> Kusn.	604
" <i>marginata</i> Turcz.	613
" <i>nipponica</i> Maxim.	576
" <i>nivalis</i> L.	588
" <i>nutans</i> Bge.	577
" " <i>f. major</i> Herder	577
" <i>obtusifolia</i> Boiss.	601
Ldb.	600
" <i>Olgae</i> Rgl. et Schmalh.	564
" " <i>var. Grombezewskii</i>	
(Kusn.) Ic.-Gal.	564
" " <i>var. punctata</i>	
B. Fedtsch.	564
" " <i>var. Renardi</i> (Rgl.) Ic.-	
Gal.	564
" <i>Olivieri</i> Griseb.	569
" " <i>f. Aucheri</i> Griseb.	570
" " <i>f. elongata</i> C. Winkl.	570
" " <i>f. grandiflora</i> Rgl.	570
" " <i>f. parviflora</i> Rgl.	570
" " <i>f. sessiliflora</i> Kusn.	570
" " <i>f. typica</i> Rgl.	570
" <i>oschtenica</i> (Kusn.) G. Woron.	586

	Pag.		Pag.
<i>Gentiana Overinii</i> (Kusn.) Grossh.	555	<i>Gentiana Romanzovii</i> Ldb.	559
" <i>paludicola</i> Koidzumi	608	" <i>rotata</i> (L.) Froel.	621
" <i>pamirica</i> Grossh.	612, 751	" <i>rotata</i> Willd.	620
" <i>paradoxa</i> Albov	554	" <i>Rurikiana</i> Cham. et Schlecht.	609
" " var. <i>latifolia</i> Albov	553	" <i>scabra</i> Bge.	594
" <i>perfoliata</i> L.	536	" " var. <i>angustifolia</i> Kusn.	544
" <i>phlogifolia</i> Schott. et Kotschy	569	" " var. <i>Bungeana</i> Kusn.	544
" <i>plebeja</i> Cham. et Schlecht.	607	" " var. <i>Fortunei</i> (Hook.) Kusn.	544
" " var. <i>haleniaeformis</i> Sukacz.	607	" <i>scabra</i> α. <i>Bungeana</i> Kusn. f. <i>angustifolia</i> Kusn.	544
" <i>pneumonanthe</i> L.	547	" " " f. <i>latifolia</i> Kusn.	544
" " f. <i>albiflora</i> Murr.	548	" " β. <i>Fortunei</i> Kusn.	544
" " f. <i>diffusa</i> Griseb.	548	" <i>schistocalyx</i> C. Koch	543
" " f. <i>latifolia</i> Schol-ler	548	" <i>septemfida</i> Ldb.	549
" " f. <i>minor</i> Brot.	547	" <i>septemfida</i> Pall.	550
" " f. <i>roseiflora</i> Lois.	548	" " var. <i>diversifolia</i> Albov	552
" <i>pontica</i> Soltok	587	" " var. <i>lagodechiana</i> Kusn.	553
" <i>praecox</i> A. et J. Kerner	602	" " α. <i>genuina</i> Kusn.	549, 550
" " f. <i>alba</i> Hegi	602	" " β. <i>cordifolia</i> Boiss.	551
" <i>pratensis</i> Froel.	606	" " γ. <i>procumbens</i> Boiss.	552
" <i>propinqua</i> Richards.	609	" " δ. <i>procumbens</i> f. <i>latifolia</i> Kusn.	551
" <i>prostrata</i> Boiss.	579	" " f. <i>adscendens</i> Kusn.	551
" " Clarke	579	" " f. <i>pauciflora</i> Kusn.	551
" " Fedtsch.	578	" " f. <i>uniflora</i> Kusn.	551
" <i>prostrata</i> Haenke	576	" <i>serrata</i> Fedtsch.	596
" <i>prostrata</i> Ldb.	577	" <i>serrata</i> Gunner	597
" " f. <i>sibirica</i> Herder	577	" <i>setiflora</i> Bge.	607
" " β. <i>Karelini</i> Kusn.	578	" <i>sibirica</i> (Kusn.) Grossh.	612
" <i>pseudoaquatica</i> Kusn.	580	" <i>spicata</i> L.	535
" <i>pulchella</i> Swartz	528	" <i>squarrosa</i> Ldb.	581
" <i>pulmonaria</i> Turcz.	614	" <i>Stelleriana</i> Cham. et Schlecht.	620, 621
" <i>punctata</i> L.	540	" <i>Szeewaldiana</i> Prodan	580
" <i>purpurea</i> L.	541	" <i>tenella</i> Ldb.	617
" " var. <i>kamtschatica</i> Griseb.	541	" <i>tenella</i> Rottb.	618
" <i>pygmaea</i> Rgl. et Schmalh.	619	" " var. <i>chrysoneura</i> (Exstam et Murb.) Grossh.	618
" <i>pyrenaica</i> auct.	572, 575	" " var. <i>Dechyana</i> Kusn.	619
" " var. <i>laciniata</i> Ja-vorka	572	" " var. <i>megacalycina</i> Grossh.	618
" <i>Regeliana</i> Gaud.	570	" <i>tenella</i> α. <i>tetramera</i> Turcz.	618
" <i>Regelii</i> Kusn.	363		
" " α. <i>genuina</i> f. <i>turkestanica</i> Kusn.	563		
" " ε. <i>glomerata</i> Kusn.	563		
" " ζ. <i>pumila</i> Kusn.	563		
" <i>Renardi</i> Rgl.	564		
" <i>rigescens</i> Franch. var. <i>japonica</i> Kusn.	549		
" <i>riparia</i> Kar. et Kir.	580		

	Pag.		Pag.
Gentiana tenella β . <i>pentamera</i> Turcz.	618	Gentianopsis Ma	590
" <i>tenuis</i> Ldb.	610	" <i>barbata</i> (Fröel.) Ma	595
" <i>tianschanica</i> Rupr.	563	" <i>ciliata</i> (L.) Ma	591
" " <i>var. glomerata</i>		" <i>detonsa</i> (Rottb.) Ma	597
" " Kusn.	564	Geranioides Sm. et Fletch., subsect.	130
" " <i>var. pumila</i> Kusn.	563	Glaucae Fed., tribus	273, 732
" " α . <i>genuina</i> Kusn.	563	Glaux L.	273
" " β . <i>intermedia</i>		" <i>maritima</i> L.	274
" " Kusn.	563	" " <i>var. alba</i> Nees	
" " ϵ . <i>glomerata</i>		" " <i>var. obtusifolia</i> Fern.	
" " Kusn.	563	" " <i>var. rubella</i> Nees	
" " ζ . <i>pumila</i> Kusn.	563	Glossonematinæ K. Schum., tribus	667
" <i>triflora</i> Pall.	547	Glumaria Boiss., sect.	312
" " " <i>f. angustifolia</i>		Glumaria Boiss. em. Bge., sect.	312
" " Kusn.	547	Golia Adans.	249
" " <i>f. latifolia</i> Her-		Golownia Maxim.	536
" " der	547	" <i>japonica</i> (Sieb. et Zucc.)	
" <i>tristriata</i> Turcz.	617	" Maxim.	537
" <i>turkestanorum</i> Gand.	610	Gomphocarpus R. Br.	668
" " <i>f. pumila</i> Grossh.	610	" <i>ftuticosus</i> (L.) R. Br.	668
" <i>uliginosa</i> Willd.	605	Goniolimon Boiss.	382
" <i>umbellata</i> M. B.	611	" <i>Besserianum</i> Nym.	404
" " <i>var. glomerata</i> Kryl.	610	" " Kusn. p.p.	401
" <i>utriculosa</i> L.	589	" <i>Besserianum</i> (Schult.) Kusn.	403
" <i>Vagneriana</i> Janka	572	" <i>callicomum</i> (C. A. M.)	
" <i>verna</i> Fedtsch. et Fler.	588	" Boiss.	389, 394
" <i>verna</i> L.	587	" <i>caucasicum</i> Klok.	401
" " <i>var. alata</i> Griseb.	588	" <i>crispum</i> (Rgl.) Lipsch.	392, 394
" " <i>var. alata</i> Ldb.	585	" <i>cuspidatum</i> Gamajun.	396
" " <i>var. pontica</i> Kusn.	587	" <i>desertorum</i> (Trautv.)	
" " α . <i>angulosa</i> Kryl.	585	" Klok.	404, 405
" " α . <i>angulosa</i> Kusn.	585	" <i>dschungaricum</i> (Rgl.) O. et	
" " α . <i>angulosa f. sibirica</i>		" B. Fedtsch.	389, 390
" " Kusn.	585	" <i>elatum</i> (Fisch.) Boiss.	385
" " β . <i>vulgaris</i> Kittel	587	" <i>eximium</i> (Schrenk)	
" " " Kusn.	588	" Boiss.	391, 394
" " " Lipsky	585	" <i>graminifolium</i> (Ait.) Boiss.	404
" " γ . <i>oschtenica</i> Kusn.	586	" <i>graminifolium</i> \times <i>G. tataricum</i>	
" " ϵ . <i>obtusifolia</i> Boiss.	587	" cum	405
" " ζ . <i>Tschichatschevii</i>		" <i>Kaufmannianum</i> Voss	381
" " Lipsky	587	" <i>orae-syvashicae</i> Klok.	402
" " L. f. <i>alba</i> Wengenm.	588	" <i>orthocladum</i> Rupr.	392, 396
" " <i>f. jantina</i> Wengenm.	588	" " <i>f. glabrum</i> Linz.	393
" <i>verna</i> Ldb.	585	" <i>rubellum</i> (S. G. Gmel.)	
" M. B.	585	" Klok.	401, 404
" <i>Vvedenskyi</i> Grossh.	597, 751	" <i>Severzovii</i> Herd.	386
" <i>Walujewii</i> Rgl. et Schmalh.	565	" <i>Sewerzovii</i> Herd. p.p.	392
" " β . <i>Kesselringi</i> Kusn.	565	" <i>speciosum</i> (L.) Boiss.	388, 435
" <i>Weschniakowii</i> Rgl.	570	" <i>speciosum var. crispum</i> O. et	
" <i>Zollingeri</i> Fawcett	582	" B. Fedtsch.	392
Gentianaceae Dumort.	525	" <i>speciosum var. lanceolatum</i>	
Gentianella Kusn., subgen.	590	" O. et B. Fedtsch.	390

	Pag.		Pag.
Goniolimon speciosum var. <i>multicaule</i>		Hippion axillare F. M. Schmidt	606
" " var. <i>typicum</i> O. et	389	Holotrichae Boiss., subsect.	409
B. Fedtsch.	388	Hottonia L.	252
" " α. <i>genuinum</i> Herd.	388	" <i>inflata</i> Ell.	252, 253
" " β. <i>alpinum</i> Herd.	392	" <i>millefolium</i> Gilib.	252
" <i>strictum</i> (Rgl.) Linz.	395	" <i>palustris</i> L.	252, 253
" <i>tarbagataicum</i> Gamajun.	390	Hottonieae (Rchb.) Endl., tribus	251
" <i>tataricum</i> (L.) Boiss.	397, 404	Hymenanthès pontica Copeland	34
" " ssp. <i>Bessermanum</i>		Hypopitys Adans.	20
Nym.p.p.	401, 403	" <i>glabra</i> DC.	21
" " var. <i>Bessermanum</i>		" <i>monotropa</i> Crantz	21
O. et B. Fedtsch.	401	" " var. <i>glabra</i> Roth.	21
" " var. α. <i>typicum</i>		" " var. <i>hirsuta</i> Roth.	21
Trautv.	397	" <i>multiflora</i> Scop.	21
" " var. β. <i>puberulum</i>		" " var. <i>glabra</i> Ldb.	21
Trautv.	397	" " var. <i>hirsuta</i> Ldb.	21
" " var. <i>puberulum</i>			
auct.	401	Ikonnikovia Linz.	378, 745
" " var. γ. <i>rubellum</i>		" <i>Kaufmanniana</i> (Rgl.) Linz.	381
Trautv.	401	" " var. <i>latifolia</i>	Z. Kub. 382
" " var. δ. <i>Bessermanum</i> Trautv.	403		
" " " ε. <i>desertorum</i>		Jasminum L.	522
Trautv.	404	" <i>fruticans</i> L.	524
" " " ζ. <i>graminifolium</i> Trautv.	404	" <i>nudiflorum</i> Lindl.	52
" " " β. <i>angustifolium</i> Boiss. p.p.	397, 401, 403	" " var. <i>aureum</i>	524
" " " γ. <i>laxiflorum</i> Boiss.	397, 404	" <i>officinale</i> L.	524
" " " f. <i>pseudo-Bessermanum</i> Klok.	404	" <i>revolutum</i> Sims	525
" " " f. <i>pumila</i> Kusn.	397	Julia Fed. et A. Los., sectio	132, 723
Gontscharovia Linz., sect.	371, 744	Kablikia minima Opiz	201
Gregoria Duby	208	Kalmia L.	23
		" <i>glauca</i> Ait.	23
		" <i>polifolia</i> Wangh.	23
		Kaufmannia Rgl.	203
		" <i>brachyanthera</i> A. Los.	207
		" <i>Semenovii</i> (Herd.) Rgl.	207
		" <i>Semenovii</i> Lipsky	207
		Lapponicae Edgar Evans, sect.	105
		Laulia Raf.	518
Halenia Borkh.	638	Ledum L.	27
" <i>corniculata</i> (L.) Cornaz	638	" <i>columbianum</i> Piper	30
" <i>elliptica</i> D. Don	639	" <i>decumbens</i> (Ait.) Small	30
" <i>Fischeri</i> Graham	639	" <i>hypoleucum</i> Kom.	29
" <i>sibirica</i> Borkh.	639	" <i>palustre</i> L.	28
Haplorthiza Ldb., subsect.	239	" <i>palustre</i> Rupr.	29
Harrimanella Cov.	70	" <i>palustre</i> var. <i>angustum</i> E. Busch	28
" <i>hypnoides</i> (L.) Cov.	70	" " var. <i>decumbens</i> Ait.	30
" <i>Stelleriana</i> (Pall.) Cov.	71	" " var. <i>dilatatum</i> Wahlb.	28
Himalaicae , sect.	105	" " var. <i>glabratum</i> Kryl.	28

	Pag.
Leiorhodium (Rehd.) Pojark., subgenus	34
Leucothoe chlorantha A. Gray	73
" <i>Grayana</i> Maxim.	73
" " var. <i>intermedia</i>	
H. Boiss.	73
" " var. <i>Maximowicziana</i>	
Takeda	73
" " var. <i>typica</i> H. Boiss.	73
" sect. <i>Eubotryoides</i> Nakai	72
Leucothoe protogaea Schimp.	23
Lerouxia Méral	258
" (Méral) Endl., sect.	258
" <i>nemorum</i> Méral	258
Ligustridium Spach	518
Ligustrina Rupr.	516
" (Rupr.) Maxim., sect.	516
" <i>amurensis</i> Rupr.	517
" " var. <i>mandschurica</i>	
Maxim.	517
" <i>Fauriei</i> (Lev.) V. Vassil.	517
" <i>japonica</i> Maxim.	517
" <i>pekinensis</i> Rupr.	517
Ligustrum L.	518
" <i>acuminatum</i> Miyabe et Miyake	521
" <i>ciliatum</i> Mansf.	521
" " var. <i>Tschonoski</i>	
(Dcne.) Mansf.	520
" <i>ciliatum</i> Rehder	520
" <i>Ibota</i> Fr. Schm.	521
" <i>Ibota</i> Sieb. et Zucc.	518
" <i>Ibota</i> var. <i>Regelianum</i>	518
" " f. <i>Tschonoski</i> (Dcne.)	
Nakai	520
" <i>japonicum</i> Thunb.	520
" <i>lucidum</i> Ait.	519
" <i>ovalifolium</i> Hassk.	520
" <i>Regelianum</i> Koehne	518
" <i>Tschonoski</i> Dcne.	520
" <i>vulgare</i> L.	522
" <i>vulgare</i> L. f. <i>fossillis</i> Palib.	518
" <i>yezeense</i> Nakai	521
" " f. <i>acuminata</i>	521
Lilac Adans.	502
" <i>media</i> Dumont de Courset	509
" <i>minor</i> Moench	509
" <i>persica</i> Lam.	509
" " <i>Rothomagensis</i> Wirb.	509
" <i>vulgaris</i> Lam.	506
Lilacum Renault	502
Limnanthemum S. G. Gmel.	643
" <i>hypnoides</i> (L.) Link	643
" <i>peltatum</i> S. G. Gmel.	644

	Pag.
Limoniopsis Lincz.	376, 744
" <i>Overinii</i> (Boiss.) Lincz.	377
Limonium Boiss., sect.	436, 438
Limonium Mill.	411
" <i>amblyolobum</i> Ik.-Gal.	426
" ? <i>alutaceum</i> Ktze.	441
" <i>anceps</i> Ktze.	473
" <i>aureum</i> (L.) Hill	435
" <i>Besserianum</i> Ktze.	403
" <i>Bungei</i> (Claus) Gamajun.	448
" <i>callicomum</i> Ktze.	394
" <i>carnosum</i> (Boiss.) Ktze.	460
" <i>caspium</i> (Willd.) Gams	449
" <i>chrysocephalum</i> (Rgl.) Lincz.	434
" <i>chrysocomum</i> (Kar. et Kir.)	
Ktze.	431
" " var. <i>pubescens</i>	
Lincz.	432
" <i>congestum</i> (Ldb.) Ktze.	423
" <i>coralloides</i> (Tausch) Lincz.	451
" <i>decipiens</i> Ktze.	451
" <i>desertorum</i> Ktze.	404
" <i>dichroanthum</i> (Rupr.) Ik.-	
Gal.	428, 431
" <i>drepanostachyum</i> Ik.-Gal.	465
" <i>dubium</i> Gamajun.	441
" <i>elatum</i> Ktze.	385
" <i>eximium</i> Ktze.	391
" <i>Fajzievii</i> Zakirov	466, 748
" <i>ferganense</i> Ik.-Gal.	454
" <i>Fischeri</i> (Trautv.) Lincz.	427
" <i>flexuosum</i> (L.) Ktze.	420
" " var. <i>angustifolium</i>	
Ik.-Gal.	423
" <i>Gmelintii</i> (Willd.)	
Ktze.	436, 438, 440, 459
" " var. <i>Megeri</i> Sal-	
mon	436, 439
" " f. <i>laxiflorum</i> Sal-	
mon	436, 439
" cf. <i>Gmelinii</i> (Willd.) Ktze.	293
" <i>graminifolium</i> Ktze.	404
" <i>Hoeltzeri</i> (Rgl.) Ik.-Gal.	426
" <i>Iljinii</i> Sobolevsk.	423
" <i>iranicum</i> (Bornm.) Lincz.	461
" <i>kaschgaricum</i> (Rupr.) Ik.-Gal.	424
" <i>Kaufmannianum</i> Ktze.	381
" <i>Klementzii</i> Ik.-Cal.	435
" <i>Komarovii</i> Ik.-Gal.	454
" <i>leptolobum</i> (Rgl.) Ktze.	429, 431
" <i>latifolium</i> (Sm.) Ktze.	442, 447
" <i>leptophyllum</i> (Schrenk) Ktze.	459

	Pag.		Pag.
Limonium <i>leptostachyum</i> Ktze.	468	Lysimachia sect. <i>Trientalis</i> Klatt	269
" <i>macrorrhizon</i> (Ldb.) Ktze.	452	" <i>barystachys</i> Bge.	263
" <i>Meyeri</i> (Boiss.) Ktze.	439	" <i>barystachys</i> Klatt	265
" <i>Michelsonii</i> Lincz.	430, 747	" <i>clethroides</i> Duby	266
" <i>myosuroides</i> Ktze.	470	" " var. <i>pubescens</i>	
" <i>myrianthum</i> (Schrenk) Ktze.	453	" " Maxim.	266
" <i>nudum</i> (Boiss. et Buhse) Ktze.	428	" " var. <i>typica</i>	
" <i>nudum</i> Grossh.	427	" " R. Knuth	266
" " Ktze. p. p.	427	" <i>davurica</i> Ldb.	267
" <i>obovatum</i> Ktze.	439	" " f. <i>angustifolia</i>	
" ? <i>ochranthum</i> Ktze.	435	" " Freyn	268
" <i>otolepis</i> (Schrenk) Ktze.	455	" " f. <i>latifolia</i>	
" <i>Owerinii</i> Ktze.	377	" " Hara	267, 268
" <i>perfoliatum</i> Ktze.	456	" <i>debilis</i> Wall.	259
" <i>piptopodum</i> Nevski	462	" <i>dubia</i> Soland.	264
" <i>Popovii</i> Z. Kub.	454	" " α . <i>typica</i> Rgl.	265
" <i>reniforme</i> (Girard) Lincz.	456	" " β . <i>longibracteata</i> Rgl.	265
" <i>Reznitzenkoanum</i> Lincz.	434, 747	" <i>ephemerum</i> Thunb.	266
" <i>sareptanum</i> (Becker) Gams	446, 449	" <i>Fortunei</i> Maxim.	265
" <i>Schrenkianum</i> Ktze.	431	" <i>japonica</i> Thunb.	259
" <i>scoparium</i> Klok.	439	" <i>linum-stellatum</i> L.	272
" " Stank.	439	" <i>nemorum</i> L.	258
" <i>sedoides</i> (Rgl.) Ktze.	434	" <i>nummularia</i> L.	257
" <i>Semenovii</i> (Herd.) Ktze.	432	" " var. <i>brevipedunculata</i>	
" " var. <i>glabrum</i> Lincz.	433	" " (Opiz) Domin	258
" <i>Sewerzowii</i> Ktze.	386	" " f. <i>cordifolia</i>	
" <i>sinuatum</i> (L.) Mill.	419	" " (Opiz) Domin	258
" <i>sogdianum</i> (M. Pop.) Ik.-Gal.	462	" " f. <i>ovalifolia</i>	
" <i>speciosum</i> Ktze.	388	" " (Opiz) Domin	258
" <i>spicatum</i> Ktze.	471	" " f. <i>rotundifolia</i>	
" <i>suffruticosum</i> (L.) Ktze.	458	" " (Opiz) Domin	258
" <i>superbum</i> Hubb.	470	" " var. <i>longipedunculata</i> (Opiz)	
" <i>Suworowii</i> Ktze.	469	" " Domin	258
" <i>tanaiticum</i> Gamajun.	439	" " subvar. <i>parvifolia</i> (Opiz) Domin	258
" <i>tataricum</i> Mill.	398	" " subvar. <i>rotundifolia</i> (Schmid-Opiz) Domin	258
" <i>tenellum</i> (Turcz.) Ktze.	425	" " <i>punctata</i> L.	260
" <i>tomentellum</i> (Boiss.) Ktze.	440, 447	" " var. <i>verticillata</i>	
" " var. <i>sareptanum</i>		" " (M. B.) Boiss.	263
" " Salmon	446	" <i>quadrifolia</i> Mill.	260
" <i>vulgare</i> Mill.	438	" <i>thyrsiflora</i> L.	269
Lochnera Rehb.	646	" <i>trientalis</i> Klatt	270
Loiseleuria Desv.	62	" <i>verticillata</i> M. B.	263
" <i>procumbens</i> (L.) Desv.	62	" <i>verticillaris</i> Spreng.	263
Lomatogonium A. Br.	620	" <i>vulgaris</i> L.	266
" <i>carinthiacum</i> (Wulfen.) A. Br.	620	" " β . <i>davurica</i> (Ldb.)	
" <i>rotatum</i> (L.) Fries	621	" " R. Knuth	267
" <i>Stellertianum</i> Kostel.	621	" <i>Zavadskii</i> Wiesn.	258
" <i>sulcatum</i> Rehb.	621		
Lyonia <i>calyculata</i> Rehb.	76		
" <i>nana</i> Makino	72		
Lysimachia L.	255		

	Pag.		Pag.
<i>Lysimachieae</i> Rehb., tribus	255	<i>Myrsine spathulata</i> Palib.	108
<i>Lysimastrum</i> Endl., sectio	266	Myrsinaceae Lindl.	107
<i>Macroightia germanica</i> Heer	475	<i>Myrtillus niger</i> Gilib.	98
<i>Macrocarpae</i> Pax, sect.	188	" <i>uliginosus</i> Drej.	96
<i>Mairania</i> Neck.	83	Naumburgia Moench	268
" <i>alpina</i> Desv.	85	" <i>guttata</i> Moench	269
" " <i>Stejneger</i>	86	" <i>thyrsiflora</i> (L.) Rehb.	269
" <i>uva-ursi</i> Desv.	83	" <i>thyrsiflora</i> (L.) Rehb.	268
<i>Megista</i> Schlechtd., sect.	242	<i>Nephrophyllidium</i> Gilg	641
<i>Melioides</i> Endl.	490	" <i>crista-galli</i> (Menz.)	
" (Endl.) V. Vassil., sect.	490	Gilg	641
Menyanthaceae G. Don	640	<i>Neritium majus</i> Ung.	662
Menyanthes L.	642	Nerium L.	662
" <i>crista-galli</i> Menz.	641	" <i>antidysentericum</i> Lepech.	653
" <i>nymphoides</i> L.	644	" <i>oleander</i> L.	662
" <i>parvula</i> Nik.	642	" <i>sibiricum</i> Medic.	653
" <i>trifoliata</i> L.	642	" <i>volynicum</i> Stanisl.	662
" <i>trifoliata</i> L.	642	Nivales Pax	190
Menziesia J. E. Smith	61	<i>Nordenskiöldia</i>	476
" <i>aleutica</i> Spreng.	65	Nummularia (Gilib.) Klatt, sect.	257
" <i>Bruckenthalii</i> Baumg.	93	Nummularia O. Ktze.	268
" <i>Bryanthus</i> Swartz	66	" <i>repens</i> Gilib.	257
" <i>coerulea</i> Swartz	64	" <i>thyrsiflora</i> O. Ktze.	269
" <i>ferruginea</i> var. <i>globularis</i>		Nymphoides Hill	643
A. Gray	62	" <i>koreanum</i> Lév.	644
" <i>pentandra</i> Maxim.	61	" <i>peltatum</i> (S. G. Gmel.).	
METACHLAMYDEAE Engl.	1	O. Ktze.	643
Metaplexis R. Br.	672	Olea L.	512
" <i>chinensis</i> Dcne.	672	" <i>chrysophylla</i> Lam.	515
" <i>japonica</i> (Thunb.) Makino	672	" <i>europaea</i> L.	513
" <i>rostellata</i> Turcz.	672, 673	" " var. <i>oleaster</i> DC.	514
" <i>Stauntoni</i> Roem. et Schult.	672	" " var. <i>sativa</i> DC.	513, 514
Moneses Salisb.	14	" " var. <i>silvestris</i> Rouy	514
" <i>grandiflora</i> Salisb.	14	" <i>oleaster</i> Hoffmsg. et Link	513, 514
" <i>uniflora</i> Alef.	14	" <i>sativa</i> Hoffmsg. et Link	513, 514
" <i>uniflora</i> (L.) A. Gray	14	Oleaceae Lindl.	483
<i>Monotropa</i> L.	20	Ophelia D. Don	625
Monotropa Nutt.	19	" <i>chinensis</i> Bge.	625
" <i>fragrans</i> Gilib.	21	" " <i>β. dahurica</i> Bge.	626
" <i>glabra</i> Bernh.	21	" <i>diluta</i> (Turcz.) Ldb.	626
" <i>hirsuta</i> Hornem.	21	" <i>tetrapetala</i> (Pall.) Grossh.	627
" <i>hypophegea</i> Wallr.	21	" " f. <i>alpina</i> B. Kolesn.	627
" <i>hypopitis</i> L.	21	" <i>Tscherskyi</i> (Kom.) Grossh.	626
" " var. <i>glabra</i> Roth.		" <i>Wilfordii</i> Kerner	628
" " " <i>hirsuta</i> Roth.	21	" " f. <i>pumila</i> Grossh.	628
" <i>multiflora</i> (Scop.) Fritsch.	21	Oreades Schischk. et Bobr. subsect.	236
" <i>uniflora</i> L.	20	Oreophlomis Rupr. sect.	182
Monotropaceae (Nutt.) Lindl.	19	Ornaster Koehne et Lingelsh. subsect.	489
<i>Myrsine centaureorum</i> Ung.	107	Ornaster (Koehne et Lingelsh.) V. Vas-	
" <i>doryphora</i> Ung.	107	sil., sect.	489
" <i>eucalyptifolia</i> Stanisl.	108		

	Pag.		Pag.
<i>Ornus</i> DC., sect.	487	<i>Pleurogyne carinthiaca</i> (Wulfen.) Gri-	
<i>Ornus</i> (DC.) V. Vassil., subgen.	487	seb.	620
<i>europaea</i> Pers.	488	<i>rotata</i> Griseb.	621
<i>Orphanidesia</i> Boiss. et Bal.	17	<i>Stelleriana</i> G. Don	621
<i>gaultherioides</i> Boiss. et		<i>sulcata</i> G. Don	621
Bal.	17	<i>Pleurotrichae</i> Boiss., subsect.	410
<i>Osmothamnus</i> DC.	40	<i>Plumbageae</i> Meissn.	295
Maxim. subgenus	40	Plumbagella Spach	297
<i>fragrans</i> DC.	43	<i>micrantha</i> (Ldb.) Spach	297
<i>pallidus</i> DC.	43	Plumbaginaceae Lindl.	292
Oxycoccus Adans.	103	<i>Plumbagineae</i> Lindl.	295
<i>microcarpus</i> Turcz. et Rupr.	104	<i>Plumbaginoideae</i> Kusn., subfam.	295
<i>oxycoccus</i> (L.) Mac-M.	103	Plumbago L.	295
<i>palustris</i> Pers.	103	<i>angustifolia</i> Spach	296
" β . <i>pusillus</i> Dunal	104	<i>capensis</i> Thunb.	296
<i>pusillus</i> Nakai	104	<i>europaea</i> L.	296
<i>quadripetalus</i> Gilib.	103	" var. <i>lapathifolia</i>	
<i>Parasyringa</i> W. W. Sm.	518	(Willd.) Woron.	296
<i>Pentameræ</i> Grossh., sect.	630	" β . <i>Tournefortiana</i>	
<i>Pentanthera</i> (G. Don) Pojark., subgen.	57	Boiss.	296
<i>Pergularia japonica</i> Thunb.	673	<i>lapathifolia</i> Willd.	296
Periploca L.	665	<i>Larpentæ</i> Lindl.	296
<i>graeca</i> L.	665	<i>micrantha</i> Ldb.	297
<i>sepium</i> Bge.	666	<i>zeylanica</i> L.	297
<i>Periplocoideae</i> K. Schum., subfam.	664	<i>Plumieroideae</i> K. Schum., subfam.	646
Pervinca Adans.	646	<i>Pneumonanthe</i> Neck., sect.	541
<i>Pervinca</i> DC., sect.	647	Poacynum Baill.	660
Phillyrea L.	510	<i>Hendersonii</i> (Hook. f.) Wood-	
<i>angustifolia</i> L.	512	son	661
<i>decora</i> Boiss. et Bal.	511	<i>pictum</i> (Schrenk) Baill.	660
<i>lanceolata</i> Ait.	512	" f. <i>convallariaeflorum</i>	
<i>latifolia</i> L.	511	Rusan.	661
" var. <i>ilicifolia</i> Willd.	511	<i>Polifolia montana</i> Nakai	74
" var. <i>obliqua</i> Willd.	511	<i>Praeflorentia</i> V. Vassil., sect.	523
<i>Medwedewii</i> Sred.	510	<i>Primula</i> Ktze.	208
<i>Vilmoriniana</i> Boiss. et Bal.	510	Primula L.	111
<i>Phlyarodoxa</i> Moore	518	<i>abchastica</i> D. Sosn.	141
Phyllodoce Salisb.	63	<i>acaulis</i> Hohen.	141
<i>aleutica</i> (Spreng.) A. Heller	64	<i>acaulis</i> Jacq. p. p.	135, 141
<i>aleutica</i> \times <i>coerulea</i>	65	" (L.) Hill	135
<i>coerulea</i> (L.) Bab.	64	" var. <i>genuina</i> Pax	135
<i>Pallasiana</i> D. Don	65	" var. <i>genuina</i> Schelkovn.	141
<i>taxifolia</i> Salisb.	64	" var. <i>iberica</i> G. F. Hoff-	
" α . <i>genuina</i> Herd.	64	mann	137
<i>Physianthus albens</i> Mart. et Zucc.	667	" var. <i>rosea</i> Boiss.	137
<i>Pieris nana</i> Makino	72	" var. <i>rosea</i> Lomak.	141
<i>Pinnatifolia</i> DC., sect.	524	" var. <i>rubra</i> Sibth. et	
<i>Plaglobasis</i> Boiss., sect.	409	Smith	137
<i>Platyhymenium</i> Boiss., sect.	420	" var. <i>Sibthorpii</i> Schel-	
<i>Platycalyx</i> Lincz., subsect.	387, 746	kovn.	141
<i>Pleurogyne</i> Eschsch., sect.	620	" var. <i>Sibthorpii</i> Pax	137

	Pag.		Pag.
<i>Primula acaulis</i> var. <i>Sibthorpii</i> (Rehb.)		<i>Primula auriculata</i> var. <i>sibirica</i> Ldb.	159
Pax	141	" <i>baldschuanica</i> B. Fedtsch.	160
" <i>ajanensis</i> E. Busch	173	" " f. <i>efarinosa</i>	
" <i>algida</i> Ad.	158	B. Fedtsch.	160
" " var. <i>armena</i> (Koch) Pax	158	" Bayerni Rupr.	113, 190, 192
" " var. <i>denudata</i> Kryl.	158	" borealis Duby	171
" " var. <i>sibirica</i> (Ldb.) Pax	158	" " var. <i>ajanensis</i>	
" " f. <i>colorata</i> Rgl.	158	(E. Busch) Hulten	173
" " f. <i>cuspidens</i> Rgl.	158	" Boveana Dene.	112
" " f. <i>typica</i> Rgl.	158	" <i>Bungeana</i> C. A. M.	159
" <i>alsophila</i> Balf. f. et Farrer	130	" <i>canescens</i>	146
" <i>altaica</i> Lehm.	168	" <i>capitellata</i> Boiss.	158
" " Pall	149	" <i>carpathica</i> (Griseb. et Schenk)	
" " Turcz.	164	Fuss	151
" <i>amoena</i> M. B.	142	" <i>caucasica</i> C. Koch	159
" <i>amoena</i> M. B. p. p.	144	" <i>Chamissonis</i> E. Busch	172
" " ssp. <i>Meyeri</i> W. W. Sm.		" <i>Columnae</i> Schur	151
et Forrest	143	" <i>Columnae</i> Tenore	146
" " var. <i>acaulis</i> C. A. M.	142	" <i>cordifolia</i> Rupr.	152
" " var. " M. B.	137	" " var. <i>ovalifolia</i> Somm.	
" " var. <i>flava</i> Rupr.	148	et Lev.	152
" " var. <i>genuina</i> Pax	142	" <i>cortusa</i> Sandor	248
" " var. <i>glabrescens</i>		" <i>cortusoides</i> Herd.	126
Schmalh.	143	" <i>cortusoides</i> L.	130
" " var. <i>grandiflora</i> Kusn.	144	" <i>cortusoides</i> Ldb. p. p.	131
" " var. <i>hypoleuca</i> (Rupr.		" <i>cortusoides</i> var. <i>albiflora</i> Theod.	
et Trautv.) Kusn.	144	et Fed.	131
" " var. <i>intermedia</i> Kusn.	144	" " var. <i>genuina</i> Turcz.	130
" " var. <i>Kasbek</i> Kusn.	142	" " var. <i>patens</i> Turcz.	131
" " var. <i>Meyeri</i> (Rupr.)		" " var. <i>typica</i> Patr.	130
Boiss.	143	" " var. " Rgl.	130, 131
" " var. <i>minuta</i> Kusn.	143	" <i>crassifolia</i> Lehm.	192
" " var. <i>Sibthorpii</i> C. Koch	137	" <i>cuneifolia</i> Ldb.	188
" " var. <i>sublobata</i> Kusn.	144	" " ssp. <i>Dubyi</i> (Pax) Hult.	188
" <i>arctica</i> Koidzumi	199	" " var. <i>Dubyi</i> Pax.	188, 189
" <i>Aucheri</i> Jaub. et Spach	112	" " " <i>elongata</i> E.	
" <i>Auricula</i> Hill	161	Busch	188, 189
" <i>auricula</i> L.	113	" <i>darialica</i> Rupr.	157
" <i>auriculata</i> Bge.	159	" " ssp. <i>farinifolia</i> (Rupr.)	
" " f. <i>caucasica</i> Bge.	159	W. W. Sm. et Fletch.	158
" " f. <i>excapa</i> Bge.	159	" " var. <i>farinifolia</i> (Rupr.)	
" " f. <i>sibirica</i> Bge.	159	Kusn.	158
" <i>auriculata</i> Lam.	183, 186	" " " <i>typica</i> Kusn.	157
" " f. <i>glacialis</i> Kusn.	183	" <i>davurica</i> Spreng.	164, 167
" " f. <i>typica</i> Kusn.	183	" <i>denticulata</i> Smith	113
" " f. <i>Tournefortii</i> Kusn.	186	" <i>drosocalyx</i> P. Pol. et Lincz.	125
" <i>auriculata</i> var. <i>Bornmülleri</i>		" <i>elatior</i> Jacq.	142, 144, 149
Hausskn.	183	" <i>elatior</i> (L.) Hill	150
" " var. <i>clava</i> Hausskn.		" " ssp. <i>carpathica</i> (Fuss)	
et Bornm.	185, 186	W. W. Sm. et Forrest.	151
" " var. <i>caucasica</i> Ldb.	183	" " ssp. <i>cordifolia</i> (Rupr.)	
" " var. <i>luteola</i> Rgl.	184	W. W. Sm. et Forrest.	152

	Pag.		Pag.
<i>Primula elatior</i> ssp. <i>Pallasii</i> (Lehm.)		<i>Primula farinosa</i> var. <i>denudata</i> Koch	164
W. W. Sm. et Forrest	149	" " var. <i>flexicaulis</i> . . .	162
" " ssp. <i>pseudoelatior</i>		" " var. <i>genuina</i> Koch	161
(Kusn.) W. W. Sm. et		" " var. <i>glabrata</i> Maak	164
Forrest	155	" " var. <i>grenlandica</i> Pax	170
" " ssp. <i>Ruprechtii</i> (Kusn.)		" " var. <i>gymnophylla</i>	
Harrison	148	Trautv. et Mey.	164
" " var. <i>amoena</i> Duby . . .	142	" " var. <i>lepida</i> (Duby) . .	164
" " var. " Rgl.	148	" " var. <i>leucophylla</i>	
" " var. <i>carpathica</i> Griseb.		Trautv. et Mey.	161, 162
et Schenk	151	" " var. <i>littoralis</i>	162
" " var. <i>carpathica</i> f. <i>polo-</i>		" " var. <i>longifolia</i>	
<i>ninensis</i> Domin	150	C. Koch	183
" " var. <i>dubia</i> Rgl.	142	" " var. <i>luteo-farinosa</i>	
" " var. <i>cordifolia</i> (Rupr.)		Rgl.	159
Pax	152	" " var. <i>mistassinica</i>	
" " var. <i>genuina</i> Pax .	148, 150	Pax	169, 172
" " var. <i>genuina</i> Trautv.	149	" " var. <i>pauciflora</i>	
" " var. " f. <i>typica</i>		C. Koch	159
Pax	150	" " var. <i>pygmaea</i>	162
" " var. <i>Pallasii</i> (Lehm.) Pax	149	" " var. <i>stricta</i> (Hornem.)	
" <i>Eugeniae</i> Fed.	113, 124	Wahlenb.	169
" <i>exaltata</i> Lehm.	164, 167.	" " var. " (Wah-	
" <i>exigua</i> Velen.	162	lenb.) Trautv.	172
" <i>eximla</i> Greene	200	" " var. <i>typica</i> Rgl. . . .	161
" <i>farinifolia</i> Rupr.	157	" " var. <i>undulata</i> (Fisch.)	
" <i>farinosa</i> L.	161	Rgl.	164
" " " s. l.	167	" " var. <i>xanthophylla</i>	
" " " s. str.	162	Trautv. et Mey.	163
" <i>farinosa</i> M. B.	158	" " var. <i>xanthophylla</i>	
" " ssp. <i>davurica</i> var.		W. W. Sm. et Fletch.	162
<i>intermedia</i> Pax . . .	164	" <i>Fauriae</i> Franch.	174
" " ssp. <i>eufarinosa</i> var.		" <i>Fauriae</i> Sugawara	173
<i>genuina</i> Pax	161	" <i>Fedtschenkoi</i> Rgl. . . .	114, 189
" " ssp. <i>fistulosa</i> (Turk.)		" <i>finmarchica</i> Jacq.	175
W. W. Sm. et Forrest.	171	" <i>fistulosa</i> Turkev.	114, 171
" " <i>lusus caucasica</i> Rgl.	159	" <i>flexuosa</i> Turkev.	187
" " " <i>turkestanica</i>		" <i>floribunda</i> Wall.	112, 113
Rgl.	159	" <i>gigantea</i> Jacq.	162, 164
" " var. <i>albiflora</i>	162	" <i>glacialis</i> Ad.	183
" " var. <i>algida</i> Trautv.	159	" <i>grandiflora</i> var. <i>orientalis</i>	
" " var. <i>armena</i> C. Koch	158	C. Koch	137
" " var. " Trautv.	159	" <i>grandis</i> Trautv.	202
" " var. " f. <i>albo-</i>		" <i>Halleri</i> J. F. Gmel.	181
<i>farinosa</i> Derganc .	159	" <i>heterochroma</i> Stapf	141
" " var. <i>armena</i> f. <i>naza-</i>		" " var. <i>flava</i> Grossh.	141
<i>rensis</i> Derganc . . .	159	" " var. <i>violacea</i>	
" " var. <i>caucasica</i> C. Koch	159	Grossh.	141
" " var. <i>chrysophylla</i>		" <i>hissarica</i> (Lipsky) Bornm. . .	213
Trautv.	162	" <i>Hookeri</i> Freyn et Sint. . . .	159
" " var. <i>chrysophylla</i>		" <i>Hornemanniana</i> Hook. . . .	172
Trautv. et Mey.	163	" <i>Hornemanniana</i> Lehm. . . .	162

	Pag.
<i>Primula Hornemanniana</i> Lehm. p. p. .	169
" <i>Iljinskii</i> Fed.	176, 726
" <i>integrifolia</i> Oeder	175
" <i>intermedia</i> Bobr.	168
" " E. Busch	168
" " Ldb.	174
" " Sims.	164, 167, 169
" " W. W. Sm. and	
" Fletch.	168
" <i>intricata</i> Gr. et Godr.	150
" <i>Juliae</i> Kusn.	132
" <i>Kaufmanniana</i> Rgl.	126
" " <i>f. albiflora</i>	
" B. Fedtsch.	124
" <i>Kaufmannii</i> Rgl.	126
" <i>Kawasimae</i> Hara	172
" <i>Knorringiana</i> Fed.	177, 726
" <i>Komarovii</i> A. Los.	137
" <i>Kusnetzovii</i> Fed.	113, 144, 723
" <i>Lacei</i> Hemsl. et Watt.	112
" <i>lactiflora</i> Schipcz.	126
" " var. <i>lactea</i> Schipcz.	126
" " var. <i>lacticortusoides</i>	
" Schipcz.	126
" <i>lactiflora</i> Turkev.	125
" <i>lepida</i> Duby	164
" <i>leucophylla</i> ssp. <i>Ruprechtii</i>	
(Kusn.) W. W. Sm. et Forrest.	148
" <i>leucophylla</i> var. <i>Ruprechtii</i>	
(Kusn.) Pax	148
" <i>longiflora</i> All.	181
" <i>longifolia</i> Curtis	183
" " M. B.	159
" <i>longipes</i> Freyn et Sint.	191
" <i>longiscapa</i> Kom.	171
" <i>longiscapa</i> Ldb.	162, 168
" <i>luteo-farinosa</i> var. <i>denudata</i>	
Rupr.	159
" <i>luteola</i> Rupr.	184
" " <i>f. macrocalyx</i> Rupr.	185
" <i>f. macrocalyx</i> Bge.	114, 146
" <i>macrophylla</i> C. Koch	183
" <i>magellanica</i> Lehm.	162
" <i>Mastumurae</i> Petitm.	173
" <i>Matthioli</i> Richter	248
" <i>megaseifolia</i> Boiss. et	
Bal.	112, 133, 135
" <i>Meyeri</i> Rupr.	135, 143
" " var. <i>cordifolia</i> Rgl.	152
" <i>minima</i> L.	201
" <i>minima</i> Mertens	188
" <i>Minkwitziae</i> W. W. Sm.	129

	Pag.
<i>Primula minutiflora</i> Forrest	235
" <i>mistassinica</i> Gray	169
" " Mischx.	162
" <i>Mnischeikii</i> Bayern	144
" <i>modesta</i> ssp. <i>ajanensis</i>	
(E. Busch) W. W. Sm. et	
Forrest	173
" <i>montana</i> Schur	151
" <i>Moorkroftiana</i> Wall.	197
" <i>nivalis</i> Ad.	183
" " Hult.	195
" <i>nivalis</i> Pall.	192
" <i>nivalis</i> Pall. p. p.	191
" " Turcz.	161
" " var. <i>albiflora</i> Rupr.	190
" " var. <i>Bayerni</i> (Rupr.)	
Rgl.	191
" " var. <i>colorata</i> Rgl.	196
" " var. " Turkev.	197
" " var. <i>farinosa</i> C. Koch.	191
" " var. " Kryl.	195
" " var. " Pax	196
" " var. " Schrenk.	196
" " var. <i>genuina</i> Kryl.	192
" " var. <i>longifolia</i> Rgl.	196
" " var. <i>longipes</i> (Freyn et	
Sint.) Kusn.	191
" " var. <i>Moorkroftiana</i>	
Pax	195, 197
" " var. <i>Moorkroftiana</i>	
Watt.	197
" " var. <i>pumila</i> Ldb.	198, 199
" " var. <i>subintegerrima</i> Rgl.	195
" " var. <i>turkestanica</i>	
Haage et Schmidt	196
" " var. <i>turkestanica</i>	
Rgl.	196
" " var. <i>typica</i> Rgl.	192
" <i>norwegica</i> Retz.	175
" <i>nutans</i> Georgi	174
" <i>obconica</i> Hance	113
" <i>ablongifolia</i> Schur	151
" <i>officinalis</i> (L.) Hill	145
" " var. <i>genuina</i> Pax	145
" " <i>f. typica</i> Pax	145
" " var. <i>inflata</i> Ldb.	147
" " var. <i>infundibulum</i>	
C. Koch	147
" " var. <i>macrocalyx</i>	
(Bge.) C. Koch	147
" " var. <i>macrocalyx</i> f.	
<i>alpina</i> Kuntze	147

	Pag.		Pag.
Primula Olgae Rgl.	185	Primula Sibthorpii var. <i>abchasica</i>	
" <i>orientalis</i> Willd.	192	(D. Sosn.) Kolak.	141
" <i>ossetica</i> Kusn.	113, 150	" <i>Sibthorpii</i> Hoffmsg.	141
" <i>Pallasii</i> Lehm.	114, 149	" <i>Sieboldii</i> E. Morren	131
" " ssp. <i>pseudoelatio</i>		" <i>Sieboldii</i> Pax	131
(Kusn.) Harrison	155	" " W. W. Sm. et Fletch.	131
" " var. <i>cordifolia</i> Boiss.	152	" <i>simensis</i> Hochst.	112
" <i>palmata</i> Hand.-Mzt.	130	" <i>sinensis</i> Lindl.	113
" <i>pamirica</i> Fed.	178, 724	" <i>stricta</i> Hornem.	162, 169
" <i>pannonica</i> Kerner	146	" " var. <i>jacutensis</i> E. Busch	172
" <i>Partschiana</i> Pax	133	" <i>suaveolens</i> Radde	147
" <i>parvifolia</i> Duby	172	" " var. <i>colchica</i> Alb.	147
" <i>patens</i> Turcz.	131	" <i>subarctica</i> Schur	151
" <i>pinnata</i> M. Pop. et Fed.	167, 725	" <i>tapetodes</i> Ktze.	209
" <i>poloninensis</i> (Domin) Fed.	150, 724	" <i>Tournefortii</i> Rupr.	185
" <i>pseudoelatio</i> Kusn.	155	" <i>tschuktschorum</i>	
" <i>pulverea</i> Fed.	198, 727	Kjeillm.	198, 199, 201
" <i>pumila</i> (Ldb.) Pax	198, 199	" <i>turkestanica</i> (Rgl.)	
" " var. <i>arctica</i> (Koidzumi)		E. A. White	114, 195, 196
" " E. Busch	199	" <i>undulata</i> Fisch.	164, 167
" " var. <i>Ledebouriana</i>		" <i>uralensis</i> Fisch.	147
E. Busch	198	" <i>Velenovskyi</i> Fritsch	146
" <i>purpurea</i> Royle	196	" <i>veris</i> L.	113, 145, 146
" <i>pyncnorhiza</i> Ldb.	183	" <i>veris</i> M. B.	147
" <i>radicata</i> Balf. f. et W. W. Sm.	182	" <i>veris</i> ssp. <i>macrocalyx</i> (Bge.)	
" <i>Regeliana</i> Fed.	114, 195, 196	Lüdi	147
" <i>renifolia</i> Volg.	134	" " var. <i>acaulis</i> L.	135
" <i>rhodantha</i> Balf. f. et W. W. Sm.	182	" " var. <i>elatio</i> L.	150
" <i>rosiflora</i> Balf. f. et W. W. Sm.	182	" " var. <i>officinalis</i> L.	145
" <i>rotundifolia</i> Pall.	174	" <i>verticillata</i> Forsk.	112
" <i>rubra</i> (Sibth. et Sm.) Dörfl.	137	" <i>volgensis</i> Bobr.	147
" <i>Ruprechtii</i> Kusn.	148	" <i>vulgaris</i> Huds.	113, 135, 138
" <i>sachalinensis</i> Nakai	162	" " ssp. <i>heterochroma</i>	
" <i>saguramica</i> Gavr.	179	(Stapf) W. W. Sm. et	
" <i>Saulteri</i> Schultz	201	Forrest	141
" <i>saxatilis</i> Pax	131	" " ssp. <i>Sibthorpii</i> (Hof-	
" <i>saxifragifolia</i> Lehm.	189	fmsgg.) W. W. Sm. et	
" <i>septemloba</i> Franchet	125	Forrest	137, 138, 141
" <i>sibirica</i> Jacq.	174	" " var. <i>heterochroma</i>	
" <i>sibirica</i> auct.	176, 178	Stapf	141
" " <i>natio ochotensis</i>		" " × <i>Sibthorpii</i>	137, 138
E. Busch	174		141
" " ssp. <i>finmarchica</i>		" <i>Warshenevskiana</i> B. Fedtsch.	182
(Jacq.) Hult.	175	" <i>Woronovii</i> A. Los.	138
" " var. <i>brevicalyx</i> Trautv.	174	" <i>xanthobasis</i> Fed.	195, 727
" " var. <i>finmarchica</i>		" <i>xanthophylla</i> Trautv. et Mey.	161
(Jacq.) Pax	175	" <i>zeylamica</i> Char. et Kap.	157
" " var. <i>integrifolia</i>		Primulaceae Vent.	108
(Oeder) Pax	175	Primulales Lindl., ordo	107
" " var. <i>parviflora</i> Rgl.	176	<i>Primulastrum</i> Duby	135
" " var. <i>rotundifolia</i> Pax	174	<i>Primulastrum</i> Duby, sectio	123
" <i>Sibthorpii</i> Hoffmsg.	137, 142	<i>Primulastrum</i> (Duby) Schott, subgenus	123

	Pag.		Pag.
<i>Pseudodouglasia</i> Ovcz., sectio	234	<i>Pyrola secunda</i> var. <i>pumila</i> Chamisso . .	17
<i>Pseudoprimula</i> Pax.	235	" " var. <i>vulgaris</i> Turcz. . .	16
<i>Psilanthum</i> Schwz., sectio	282, 285	" <i>soldanellifolia</i> H. Andres . . .	10
<i>Psylliostachys</i> Jaub. et Sp., subgen. .	467	" <i>tianschanica</i> Polak.	10
<i>Psylliostachys</i> (Jaub. et Sp.) Nevski .	467	" <i>umbellata</i> L.	17
" <i>anceps</i> (Rgl.) Roshk.	473	" <i>unifolia</i> L.	14
" " \times <i>P. leptostachya</i>	474	" <i>uniflora</i> L.	14
" <i>Androssovii</i> Roshk.	474, 749	" <i>virescens</i> Schweig.	9
" <i>leptostachya</i> (Boiss.)		Pyrolaceae Lindl., fam.	7
" Roshk.	468, 471		
" <i>myosuroides</i> (Rgl.)		Ramischia Opiz	15
" Roshk.	470	" <i>obtusata</i> (Turcz.) Freyn . .	16
" <i>spicata</i> (Willd.) Nevski	471	" <i>secunda</i> (L.) Garcke	16
" <i>Suvorovii</i> (Rgl.) Roshk.	469	" " ssp. <i>obtusata</i>	
" " \times <i>P. leptostachya</i>	470	" H. Andres	17
<i>Pterocladus</i> Boiss., sect.	419	" " var. <i>obtusata</i> Turcz. . .	16
<i>Pterostegia</i> Bge., sect.	310	" " var. <i>vulgaris</i> Kryl. . .	16
<i>Pterygocalyx</i> Maxim.	536	" <i>secundiflora</i> Opiz	16
" <i>volubilis</i> Maxim.	537	<i>Rauwolfia plumeriaefolia</i> Ett.	646
<i>Pulvinaria</i> Boiss., sect.	312	<i>Rellesta cyanea</i> Turcz.	627
<i>Pycnostelma</i> Bge.	671	Rhododendroideae Drude, subfam. . .	26
" <i>chinense</i> Bge.	671	Rhododendron L.	31
" <i>paniculata</i> (Bge.)		" sect. <i>Azalea</i> Maxim.	
" K. Schum.	671	" p. p.	50, 57
Pyrola L.	8	" sect. <i>Chamaecistus</i>	
" <i>chlorantha</i> Sw.	9	" G. Don	58
" <i>frutescens</i> Gilib.	17	" sect. <i>Lepipherum</i> G. Don . .	46
" <i>grandiflora</i> Radius	12	" sect. <i>Tsusia</i> Maxim.	55
" <i>groenlandica</i> Horn.	12	" sect. <i>Tsusutsi</i> G. Don . . .	
" <i>incarnata</i> Fisch.	11	" p. p.	56
" " var. <i>xanthanthera</i>		" <i>Adamsii</i> Rehd.	40
" N. Busch	12	" <i>alpinum</i> Lerchenfeld	44
" <i>macrocalyx</i> Ohwi	10	" <i>anthopogon</i> D. Don	40
" <i>media</i> Sw.	12	" <i>anthopogon</i> E. Busch . . .	43
" <i>minor</i> L.	13	" " var. <i>fragrans</i>	
" <i>obtusata</i> Turcz.	17	" I. Kuzn.	43
" <i>obtusata</i> (Turcz.) Freyn	16	" <i>anthopogonoides</i> Maxim. . .	43
" " var. <i>brevistyla</i> N.		" <i>aureum</i> Georgi	38
" Busch	17	" <i>caucasicum</i> Pall.	36, 39
" <i>pumila</i> Horn.	12	" <i>cephalanthum</i> Franch. . . .	43
" <i>renifolia</i> Maxim.	9	" <i>chrysanthum</i> Pall.	38
" <i>rotundifolia</i> L.	10	" <i>Collettianum</i> Aitch. et . . .	
" " ssp. <i>albiflora</i> Kryl.	10	" Hemsl.	43
" " <i>incarnata</i> Kryl.	11	" <i>confertissimum</i> Nakai . . .	45
" " var. <i>grandiflora</i>		" <i>dahuricum</i> L.	48, 50
" Fern.	12	" <i>dahuricum</i> Kom. et	
" " <i>incarnata</i> DC.	11	" Aliss.	50
" " var. <i>longistyla</i>		" <i>dahuricum</i> Nakai	47
" N. Busch	11	" " auct. fl. ross.	50
" " <i>pumila</i> Hornm.	12	" <i>dahuricum</i> var. <i>albiflorum</i> . .	
" <i>secunda</i> L.	16	" Turcz.	49
" " var. <i>nummularia</i> Rupr. . .	17		

	Pag.		Pag.
<i>Rhododendron dahuricum</i> var. <i>atrovirens</i>		<i>Rhododendron lancifolium</i> Moench . . .	34
Edw. . .	55	" <i>lapponicum</i> (L.) Wahlenb.	46
" " var. <i>sempervirens</i> Sims.	55	" " var. <i>parvifolium</i> I. Kuzn.	45
" " α . <i>dahuricum</i>		" <i>lazicum</i> Massalsk.	36
Maxim.		" <i>Ledebourii</i> Pojark.	52, 722
p. p. . .	48, 52	" <i>luteum</i> Sweet	57
" " α . <i>genuinum</i>		" <i>mucronulatum</i> Turcz.	47, 50
Herd. . . .	49	" " var. <i>albiflorum</i> Nakai	47
" " β . <i>atrovirens</i>		" " var. <i>ciliatum</i> Nakai	47
Edw. . . .	52	" <i>myrtifolium</i> Schott et	
" " β . <i>mucronulatum</i> Maxim.	47, 48	Kotschy	44
" " β . <i>roscum</i> DC.	48	" <i>pallidum</i> Dümml.	43
" " β . <i>sempervirens</i>		" <i>palustre</i> Turcz.	45
Sims	52	" <i>parviflorum</i> Middend. . . .	45
" " γ . <i>album</i> DC.	48	" <i>parvifolium</i> Adams	45
" <i>davuricum</i> Ldb.	52	" " var. <i>alpinum</i>	
" <i>ferrugineum</i> Georgi	45	Glehn	45
" <i>ferrugineum</i> L.	44	" " f. <i>albiflorum</i>	
" <i>flavum</i> G. Don	57	Herd. . . .	45
" <i>fragrans</i> Maxim.	43	" " f. <i>alpinum</i>	
" <i>gaultherioides</i> Boiss. et		Glehn	45
Bal.	77	" <i>ponticum</i> L.	31
" <i>glandulosum</i> Standley . . .	59	" <i>ponticum</i> L.	34
" <i>hirsutum</i> Baumg.	44	" <i>ponticum</i> Schreb.	57
" <i>hirsutum</i> L.	44	" <i>ponticum</i> var. <i>brachycarpum</i> Boiss.	35
" <i>hypopitys</i> Pojark.	37, 721	" <i>ponticum</i> var. " <i>brachyscapum</i> " Boiss.	35
" <i>kamtschaticum</i> Pall.	31	" " " <i>Scorpilii</i>	
" <i>kamtschaticum</i> Pall.	58	Domin	35
" " ssp. <i>glandulosum</i>		" " h. <i>brachycarpum</i>	
(Standley)		Boiss. . . .	34
" " ssp. <i>intercedens</i>		" <i>procumbens</i> Wood	63
Hult. . . .	60	" <i>Redowskianum</i> Maxim. . . .	60
" " ssp. <i>typicum</i> Hult.	59	" <i>sichotense</i> Pojark.	50, 722
" " var. <i>glandulosum</i>		" <i>Smirnovii</i> Trautv.	36
(Standl.)		" <i>Schlechtenbachii</i> Kitag. . . .	56
" " Hult. . . .	59	" <i>Schlippenbachii</i> Maxim. . . .	56
" " var. <i>Palasianum</i>		" <i>trinerve</i> Franch.	55
Kom. . . .	59	" <i>Tschonoskii</i> Maxim.	55
" " var. <i>pumilum</i> E.		" <i>Ungernii</i> Trautv.	35
Busch. . . .	59	" <i>viscosum</i> Fisch.	60
" Kotschy Simk.	44	<i>Rhodorastrum</i> (Maxim.) Drude, subgen.	46
" " f. <i>album</i> (Millais)		<i>Rhodostegia</i> Dcne., sect.	709
Rehd. . . .	44	<i>Rhodostegiella</i> Pobed., sect. . . .	707, 753
		<i>Robusta</i> Mansf., subsect.	519
		<i>Rugosae</i> Grossh., subsect.	635

	Pag.		Pag.
Samoleae Rehb., tribus	253	Statice <i>alutacea</i> Stev.	441
Samolus L.	253	" <i>amblyoloba</i> M. Pop.	430
" <i>aquaticus</i> Lam.	254	" <i>anceps</i> Rgl.	473
" <i>bracteatus</i> Stokes	254	" <i>aphylla</i> Poir.	451
" <i>floribundus</i> H. B. K.	255	" <i>argentea</i> Pall.	394
" <i>geniculatus</i> Dulac	254	" <i>Armeria</i> var. <i>sibirica</i> Ostenf. et	
" <i>Valerandi</i> L.	254	Lund	409
" " var. <i>floribundus</i>		" " β . <i>arctica</i> Ldb.	411
(H. B. K.)		" " β . <i>elongata</i> DC.	410
R. Knuth	255	" <i>aurea</i> L.	435
" " var. <i>typicus</i>		" <i>Besseriana</i> Schult.	403, 404
R. Knuth	255	" <i>bracteata</i> Girard	312
Samuelia Schlecht., sect.	235	" <i>Bungei</i> Claus	448
Sapotaceae Dumort., fam.	474	" <i>callicoma</i> C. A. M.	394
Sapotacites Butterlickii Ett.	475	" <i>carnosa</i> Boiss.	460
" <i>parvifolius</i> Ett. var. <i>maior</i> Stanisl.	475	" " Bornm.	461
" aff. <i>minusops</i> Ett.	475	" <i>caryophyllacea</i> Boiss. et Hoh.	346
" <i>daphnes</i> Ett.	475	" <i>caspia</i> Willd.	449
Sarcophyllae Boiss., subsect.	457	" " var. <i>robusta</i> Lipsky ex	
Sarcophyllum (Boiss.) Lincz., sect.	457	Kusn.	449
Schollera <i>oxycoccus</i> Roth.	103	" " β . <i>kimmerica</i> Lipsky 449, 451	
Schweykerta C. C. Gmel.	643	" " β . <i>patens</i> Boiss.	449, 451
Sciadorhodion (Rehd. et Wils.) Cope-		" <i>chrysocephala</i> Rgl.	434
land, subgenus	56	" <i>chrysocoma</i> Kar. et Kir.	431
Sczukinia Turcz.	625	" <i>congesta</i> Ldb.	423
" <i>diluta</i> Turcz.	626	" ? <i>conspicua</i> Sims	388, 389
Seutera Rehb.	710	" <i>coralloides</i> Tausch	451
" <i>Wilfordii</i> (Franch. et Sav.)		" <i>coriaria</i> Pall.	442
Pobed.	713	" ? <i>czurjukiensis</i> Klok.	441
Sibirica W. W. Sm. and Fletch.,		" <i>daurica</i> Pall.	423
subsect.	174	" <i>decipiens</i> Ldb.	451
Sinenses Mansf., subsect.	520	" <i>desertorum</i> Trautv.	404, 405
Siphonocalyx Lincz., sect.	462, 749	" <i>dichroantha</i> Ik.-Gal.	430
Soldanella L.	249	" " Rupr.	428
" <i>armena</i> Lipsky	250	" ? <i>donetzica</i> Klok.	441
" <i>hungarica</i> Simk.	250	" <i>dschungarica</i> Rgl.	390
" <i>minima</i> Hoppe	250	" <i>Echinus</i> Hohenack.	348
" <i>montana</i> Mikan	250	" " L. p. p.	342
Soladnelleae (Pax) Fed., tribus	249	" " M. B.	348
Sphondylia (Duby) Rupr., subgenus	112	" <i>elata</i> Fisch.	385
Spicaria Griseb, sect.	534	" <i>elongata</i> Hoffm.	410
Spicatae R. Knuth, subsect.	263	" <i>erectiflora</i> B. Fedtsch. et	
Sredinskya Stein., sect.	202	Gontsch.	459
Sredinskya (Stein.) Fed.	202	" <i>erinacea</i> Jaub. et Sp.	370
" <i>grandis</i> (Trautv.) Fed.	202	" <i>eximia</i> Schrenk	391
Statice L.	408, 411	" " var. <i>turkestanica</i>	
" <i>acerosa</i> Hohenack.	342, 348	Rgl.	391, 392
" " Ldb. p. p.	342	" <i>ferganensis</i> Ik.-Gal.	454
" " M. B. p. p.	343	" <i>Fischeri</i> Trautv.	427
" <i>aciphylla</i> Jaub. et Sp.	348	" <i>flexuosa</i> L.	420
" <i>alata</i> Rgl. et Schm.	386	" " Less.	385
" <i>Alberti</i> Rgl.	473	" " O. et B. Fedtsch.	465

	Pag.
<i>Statice glauca</i> Less.	458
" " Willd.	437
" <i>glumacea</i> Jaub. et Sp.	350
" <i>Gmelini</i> M. B.	441
" " Willd.	436
" " ssp. <i>genuina</i> Wangerin	437
" " " " var. <i>vulgaris</i> f. <i>steiroclada</i> Wangerin	448
" " " <i>scoparia</i> Wangerin	439
" " " <i>tomentella</i> Wangerin	441
" " " " ? var. <i>subglabra</i> Wangerin	441
" " " " var. <i>typica</i> Wangerin	441
" " var. <i>grandis</i> M. Pop.	439
" " var. <i>limonioides</i> Wangerin	439
" " var. α . <i>typica</i> Trautv.	436
" " var. β . <i>scoparia</i> Trautv.	436
" " var. γ . <i>steiroclada</i> Trautv.	448, 449
" " var. δ . <i>tomentella</i> Trautv. f. <i>glabella</i> Trautv.	441
" " f. <i>trachycaulis</i> Trautv.	441
" " α . <i>scoparia</i> Schmalh.	437
" " α . <i>genuina</i> Boiss.	436
" " γ . <i>laxiflora</i> Boiss.	439
" " \times <i>latifolia</i>	446
" <i>gracilis</i> Fisch.	448, 449
" " O. et B. Fedtsch.	454
" <i>graminifolia</i> Ait.	404
" " var. α . <i>typica</i> Rgl.	404
" " var. β . <i>desertorum</i> Rgl.	404
" <i>halochrysa</i> Fisch.	431
" <i>hirsuta</i> Presl	419
" <i>Hohenackeri</i> Jaub. et Sp.	348
" " Ldb. p. p.	350, 356
" <i>Höltzeri</i> Rgl.	426
" <i>horrida</i> Girard	348
" ? <i>hypanica</i> Klok.	441
" <i>incana</i> Ldb.	394
" " M. B.	402
" <i>intermedia</i> Czern.	446
" <i>Jauberti</i> Girard	370
" ? <i>junceae</i> Tatarinow	429
" ? <i>juniperina</i> Willd.	349, 370, 371
" <i>Karelinii</i> Stschehl.	366
" <i>kaschgarica</i> Rupr.	424

	Pag.
<i>Statice Kaufmanniana</i> Rgl.	381
" <i>latifolia</i> Korsh.	446
" " Sm.	442
" <i>latissima</i> Kar. et Kir.	453
" <i>laxiflora</i> Novopokr.	439
" <i>leptoloba</i> Michelson.	430
" " Rgl.	429
" " var. β . <i>subaphylla</i> Rgl.	429
" <i>leptophylla</i> Schrenk	459
" " var. β . <i>iranica</i> Bornm.	461
" <i>leptostachya</i> Boiss.	468
" <i>lepturoides</i> Jaub. et Sp.	343
" <i>Limonium</i> L.	438
" <i>lycopodioides</i> Girard	314
" <i>lyrata</i> M. B.	471
" <i>macrorhiza</i> Ldb.	452
" ? <i>maeotica</i> Klok.	446
" <i>maritima</i> ssp. <i>arctica</i> Hult.	411
" " ssp. <i>labradorica</i> Hult.	411
" " var. <i>sibirica</i> Simmons	409
" <i>membranacea</i> Czern.	448, 449
" <i>Meyeri</i> Boiss.	439
" " var. <i>salina</i> Grossh.	439
" " var. <i>umbrosa</i> Grossh.	439
" <i>myosuroides</i> Rgl.	470
" <i>myriantha</i> Schrenk	453
" <i>nuda</i> Boiss. p. p.	427
" " Grossh.	427
" <i>oblongifolia</i> Kotov	439
" <i>obovata</i> Ldb.	439, 440
" <i>ochrantha</i> Kar. et Kir.	435
" <i>otolepis</i> Schrenk	455, 456
" <i>Owerini</i> Boiss.	377
" <i>patens</i> Fisch.	449
" <i>perfoliata</i> C. A. M.	456
" " β <i>reniformis</i> Boiss.	456
" " Kar.	456
" <i>Popovii</i> Z. Kub.	454
" <i>pungens</i> Jaub. et Sp.	370
" <i>reniformis</i> Girard	456
" <i>reticulata</i> M. B.	449
" <i>rosea</i> Pall.	420
" <i>rubella</i> S. G. Gmel.	402
" <i>sareptana</i> Becker	446
" <i>Schrenkiana</i> Fisch. et Mey.	431
" <i>scoparia</i> M. B.	439
" " Pall.	437
" <i>sedoides</i> Rgl.	434
" <i>Semenowi</i> Herd.	432
" <i>Sewerzowi</i> Rgl.	386
" " var. α . <i>typica</i> Rgl.	386

	Pag.		Pag.
<i>Statice</i> Sewerzowi var. <i>β. alata</i> (Rgl. et Schmalh.) Rgl.	386	Subdrupaceae Mansf., sect.	519
" <i>sinuata</i> L.	419	Swertia L.	629
" <i>sisymbriifolia</i> Jaub. et Sp.	471	" <i>anomala</i> Nakai	628
" <i>sogdiana</i> M. Pop.	462	" Aucheri Boiss.	636
" <i>speciosa</i> L.	388	" <i>carinthiaca</i> Wulfen.	620
" " var. <i>α. typica</i> Rgl.	388	" <i>chinensis</i> (Bge.) Franch.	625
" " var. <i>β. lepidota</i> Rgl. p. p. 392, 395, 396		" <i>connata</i> Schrenk	632
" " var. <i>γ. crispa</i> Rgl.	392, 394, 396	" " <i>α. et β.</i> Ldb.	632
" " var. <i>δ. lanceolata</i> Rgl.	390	" " <i>f. alternans</i> Schrenk	632
" " var. <i>ε. stricta</i> Rgl.	395, 396	" " <i>f. genuina</i> Grossh.	632
" " <i>α. genuina</i> Kryl.	388	" <i>corniculata</i> L.	639
" <i>spicata</i> Kusn. p. p.	469, 471	" <i>dichotoma</i> L.	622
" " O. et B. Fedtsch. p. p.	469, 471, 473	" <i>erosula</i> Gontsch.	638
" <i>spicata</i> Willd.	471	" <i>graciliflora</i> Gontsch.	636
" " <i>β. glabra</i> Rgl.	469	" <i>iberica</i> Fisch. et Mey.	630
" <i>Spiridonowi</i> B. Fedtsch.	462	" " var. <i>albida</i> Fisch. et Mey.	630
" <i>suffruticosa</i> L.	458	" " var. <i>coerulea</i> Fisch. et Mey.	631
" " var. <i>carnosa</i> Kusn.	460	" <i>lactea</i> Bge.	637
" " var. <i>leptophylla</i> Trautv.	459	" <i>marginata</i> Schrenk	635
" " var. <i>typica</i> Trautv.	458, 460	" <i>obtusata</i> Ldb.	631
" <i>Saworowi</i> Rgl.	469	" " <i>β. albiflora</i> Ldb.	631
" <i>superba</i> Rgl.	470, 471	" " <i>f. albiflora</i> Kar. et Kir.	631
" <i>tatarica</i> L.	398	" <i>Pallasii</i> D. Don	627
" " var. <i>angustifolia</i> M. B.	703	" <i>perennis</i> L.	630
" " var. <i>α. typica</i> Rgl. p. p.	398, 402	" <i>perennis</i> M. B.	630
" " var. <i>β. Besseri</i> ana Rgl.	403	" <i>perennis β. alternifolia</i> Cham. et Schlecht.	631
" " <i>β. Besseri</i> ana Schmalh. p. p.	402	" " <i>β. obtusa</i> Griseb.	631
" <i>tenella</i> Rgl. p. p.	425, 426	" <i>persica</i> Griseb.	636
" <i>tenuifolia</i> Jaub. et Sp.	348	" <i>petiolata</i> Don	635
" <i>tomentella</i> Boiss.	441	" <i>punctata</i> Boiss.	630
" " ssp. <i>sareptana</i> Nym.	446	" " var. <i>concolor</i> Alb.	630
" " var. <i>patens</i> Leisle	441	" <i>rotata</i> L.	621
" " var. <i>stepposa</i> Leisle	441	" <i>stigmatantha</i> C. Koch	630
" <i>turkestanica</i> Gandoger	468	" <i>sulcata</i> Rottb.	620
<i>Staticeae</i> Rechb.	298	" <i>tetrapetala</i> Pall.	627
<i>Statioideae</i> Kusn., subfam.	298	" <i>Tscherskii</i> Kom.	626
<i>Staticopsis</i> Boiss., sect.	327	" <i>veratroides</i> Maxim.	635
<i>Staticopsis</i> Boiss. em. Bge., sect.	327, 340	" <i>Wilfordii</i> Kerner	628
<i>Steirostemon</i> Phil.	253	SYMPETALAE Eichl.	1
<i>Stellera</i> Turcz.	625	Syringa L.	502, 516
" <i>cyanea</i> Turcz.	627	" <i>amurensis</i> Rupr.	517
<i>Stenocalyx</i> Lincz., subsect.	397, 746	" " <i>genuina</i> Maxim.	517
<i>Stenostoma</i> Bge., subsect.	366	" <i>angustifolia</i> Salisb.	509
<i>Stenostomata</i> Boiss., subsect.	366	" <i>Bretschneideri</i> Lemoine	504
		" <i>chinensis</i> Willd.	509
		" <i>cordifolia</i> Stokes	506
		" <i>corellata</i> A. Braun	509
		" <i>Fauriei</i> Leveillé	517
		" <i>Josikaea</i> Jacq.	504
		" <i>laciniata</i> Mill.	509

	Pag.
<i>Syringa latifolia</i> Salisb.	506
" <i>persica</i> L.	509
" " var. <i>coriacea</i> Lingelsh.	509
" " f. <i>laciniata</i> Vahl.	509
" " × <i>Syringa vulgaris</i>	510
" <i>prunifolia</i> Kit.	504
" <i>robusta</i> Nakai	505
" <i>rothomagensis</i> Ach. Rich.	509
" <i>villosa</i> Kom.	505
" <i>villosa</i> Vahl	504
" " var. <i>hirsuta</i> C. K. Schn.	505
" <i>vincetoxicifolia</i> Baumg.	504
" <i>vulgaris</i> L.	506

<i>Taenioxylon porosum</i> Felix	475
--	-----

<i>Tetralix septentrionalis</i> E. Mey.	90
---	----

<i>Thelaia chlorantha</i> Alef.	9
---	---

" <i>grandiflora</i> Alef.	12
------------------------------------	----

" <i>rotundifolia</i> Alef.	10
-------------------------------------	----

<i>Therorhodon</i> (Maxim.) Drude, subgen.	58
--	----

<i>Therorhodon</i> Small	58
------------------------------------	----

" <i>camtschaticum</i> Small	59
--	----

" <i>glandulosum</i> Standley	59
---	----

<i>Thylacites</i> Griseb., sect.	582
--	-----

<i>Thysanthus</i> Schrank	268
-------------------------------------	-----

<i>Trachomitum</i> Woodson	652
--------------------------------------	-----

" <i>armenum</i> Pobed.	657
---------------------------------	-----

" <i>lancifolium</i> (Russan.)	
--	--

Pobed.	658
----------------	-----

" <i>Russanovli</i> Pobed.	654
------------------------------------	-----

" " f. <i>angustifolium</i> Illicz.	654
---	-----

" " f. <i>latifolium</i> Illicz.	654
--	-----

" <i>sarmatiense</i> Woodson	653
--	-----

" <i>scabrum</i> (Russan.) Pobed.	659
---	-----

" " f. <i>glabrum</i> Pobed.	659
--------------------------------------	-----

" <i>tauricum</i> Pobed.	657
----------------------------------	-----

<i>Tragacanthina</i> Bge., sect.	340, 366
--	----------

<i>Tricuspidaria</i> Lincz., sect.	387, 745
--	----------

<i>Trientalis</i> L.	269
------------------------------	-----

" <i>alsinaeflora</i> Gilib.	270
--------------------------------------	-----

" <i>arctica</i> Fisch.	271
---------------------------------	-----

" <i>europaea</i> Cham. et Schlecht.	271
--	-----

" <i>europaea</i> L.	270
------------------------------	-----

" ssp. <i>arctica</i> (Fisch.)	
--	--

Hult.	271
---------------	-----

" " var. <i>angusta</i>	
-----------------------------------	--

H. Lindb.	271
-------------------	-----

" " var. <i>arcticaeformis</i>	
--	--

Iljinski	270
--------------------	-----

	Pag.
<i>Trientalis europaea</i> var. <i>genuina</i> Trautv. et Mey.	270
" " var. <i>ramosa</i> Iljinski	270
" " var. <i>α. eurasiatica</i> R. Knuth	270
" " var. <i>β. arctica</i> (Fisch.) Ldb.	271

<i>Tripetaleia</i> S. et Z.	27
-------------------------------------	----

" <i>bracteata</i> Maxim.	26
-----------------------------------	----

" <i>paniculata</i> S. et Z.	27
--------------------------------------	----

<i>Tripterospermum japonicum</i> Maxim.	537
---	-----

Trochodendraceae	476
----------------------------	-----

Tsutsutsi (G. Don) Pojark., subgenus	55
--	----

<i>Unedo edulis</i> Hoffmns. et Link	80
--	----

<i>Unicuspidaria</i> Lincz., sect.	385, 745
--	----------

<i>Urostelma</i> Bge.	672
-------------------------------	-----

<i>Urostelma chinensis</i> Bge.	672
---	-----

<i>Uva-ursi procumbens</i> Moench	83
---	----

" <i>uva-ursi</i> Britton	83
-------------------------------------	----

Vacciniaceae Lindl.	93
------------------------------------	----

Vaccinium L.	94
-----------------------------	----

Vaccinium subgen. <i>Oxycoccus</i> Drude	103
---	-----

" sect. <i>Oxycoccus</i> Hook.	103
--	-----

" <i>acheronticum</i> Ung.	94
------------------------------------	----

" <i>arctostaphylos</i> L.	102
------------------------------------	-----

" <i>Chamissonis</i> Bongard	99
--	----

" <i>daphnifolium</i> Stanisl.	94
--	----

" <i>hirtellum</i> Ait.	94
---------------------------------	----

" <i>hirtum</i> Thbg.	95
-------------------------------	----

" " var. <i>typicum</i> Maxim.	96
--	----

" " vat. <i>Smallii</i> A. Gray	96
---	----

" <i>microcarpum</i> Schmalh.	104
---------------------------------------	-----

" <i>myrtillus</i> L.	94
-------------------------------	----

" <i>myrtillus</i> L.	97
-------------------------------	----

" " var. <i>alpinum</i> Turcz.	98
--	----

" " var. <i>nanum</i> Bobr.	98
-------------------------------------	----

" " var. <i>turfosum</i>	
------------------------------------	--

Choroschk.	98
--------------------	----

" f. <i>leucocarpum</i>	
-----------------------------------	--

Dum.	98
--------------	----

" <i>ovalifolium</i> Smith	99
--------------------------------------	----

" <i>oxycoccus</i> L.	103
-------------------------------	-----

" " var. <i>microcarpum</i>	
---------------------------------------	--

(Turcz.) Fedtsch.	104
---------------------------	-----

" <i>praetrococcum</i> Baik.	94
--------------------------------------	----

" <i>praestans</i> Lamb.	100
----------------------------------	-----

" <i>Smallii</i> A. Gray	95
------------------------------------	----

" <i>uliginosum</i> L.	94
--------------------------------	----

" <i>uliginosum</i> L.	96
--------------------------------	----

	Pag.		Pag.
Vaccinium uliginosum var. alpinum		Vinca ovatifolia Stokes	649
E. Busch	96	" pubescens Urv.	648
" var. genuinum		" pumila Clarke	649
Herd.	96	Vincetoxicum Moench.	674
" var. leucocarpum		" acuminatum Dcne.	706
B. Fedtsch.	97	" album Aschers.	697
" var. vulcanorum		" amplexicaule Sieb. et Zucc.	705
(Kom.) E. Busch	97	" amplifolium C. Koch.	680, 681
" f. angulosum		" atratum (Bge.) Morr. et	
Nakai	97	Dcne.	704
" f. alpinum Nakai	97	" darvasicum B. Fedtsch.	693
" f. depressum		" funebre Boiss. et Ky.	691, 693
Nakai	97	" fuscatum	689
" f. ellipticum		" inamoenum Maxim.	707
Nakai	97	" intermedium Taliev	680, 689
" vitis idaea L.	94	" jailocola Juz.	696
" vitis idaea L.	100	" Kuznetzowii E. Bordz.	688
" " var. genuinum		" latifolium C. Koch.	601
Herd.	101	" laxum (Bartl.) Gren. et	
" " var. pumilum		Godr.	701
Hornem.	101	" " Stankov	702
" vitis idaea " microphyllum		" " auct.	683, 690, 696, 697
Herd.	101	" maeoticum (Kleop.) Barbar.	687
" vulcanorum Kom.	97	" medium Ldb.	691
Verbasculum Rupr.	135	" " Schmalh. p. p.	684, 690
Vernales Pax	135	" " Stev.	682
Verticillatae R. Knuth, sectio	260	" var. latifolium	
Villarsia crista-Galli Griseb.	641	Trautv.	691
Villosae C. K. Schn., sect.	504	" minus C. Koch	680, 687, 688
Villosae Hand.-Mzt., subsect.	221	" mugodsharicum	
Vinca L.	646	Pobed.	680, 690
" acutiflora Bertol.	647	" nigrum Ldb.	689
" ellipticifolia Stokes	647	Moench	681
" erecta Rgl. et Schmalh.	650	" var. volubile Radde	682
" var. bucharica Fedtsch.	652	" officinale Grinevezk.	682
" var. glabra Fedtsch.	652	" officinale Ldb. p. p.	701, 702
" var. hirsuta Fedtsch.	651	" Moench	697
" grandiflora Salisb.	649	" Radde	695
" herbacea Waldst. et Kit.	649	" auct.	683, 702
" var. herbacea Pichon	652	" f. leicalyx	
" var. libanotica Pichon	650	Somm. et Lev.	694
" f. macrantha E. Bordz.	650	" pumilum (Dcne.) Pobed.	692
" f. micrantha E. Bordz.	650	" Raddeanum Alb.	695
" f. pusilla DC.	650	" Rehmanni Boiss.	681, 682
" humilis Salisb.	647	" rossicum (Kleop.) Barbar.	690
" intermedia Tausch	647	" scandens Somm. et	
" major L.	649	Lev.	680, 682
" var. major Pichon	648	" sibiricum (L.) Dcne.	707
" β. pubescens Boiss.	648	" stauropolitanum Pobed.	695
" major Ldb.	648	" tauricum Pobed.	696
" minor L.	647	" thesioides Freyn	707
" mixta Velen.	650	" triste C. Koch	680

	Pag.		Pag.
<i>Vincetoxicum volubile</i> Maxim.	703	<i>Visiana</i> DC.	518
" <i>vulgare</i> Jundz.	697	<i>Vitis idaea</i> Koch, sect.	100
" <i>Wilfordii</i> Franch. et Sav.	713	<i>Vulgares</i> C. K. Schn., sect.	506
" sp. n. Alb.	694	<i>Waldschmidtia</i> Bluff et Fing.	643
<i>Vincopsis</i> Pobed., sect.	650, 752		

VEGETATION REGIONS OF THE USSR

Abbreviated name	Full name
I. Arctic	
1. Arc. Eur.	Arctic (European part)
2. Nov. Z.	Novaya Zemlya
3. Arc. Sib.	Arctic (Siberia)
4. Chuk.	Chukchi
5. An.	Anadyr ¹
II. European part	
6. Kar. -Lap.	Karelia-Lapland
7. Dv. -Pech.	Dvina-Pechora
8. Balt.	Baltic States
9. Lad. -Ilm.	Ladoga-Il'men
10. U. V.	Upper Volga
11. V. -Kama.	Volga-Kama
12. U. Dnp.	Upper Dnieper
13. M. D.	Middle Dnieper
14. V. -Don	Volga-Don
15. Transv.	Transvolga area
16. U. Dns.	Upper Dniester
17. Bes.	Bessarabia
18. Bl.	Black Sea area
19. Crim.	Crimea
20. L. Don	Lower Don
21. L. V.	Lower Volga
III. Caucasus	
22. Cisc.	Ciscaucasia
23. Dag.	Dagestan
24. W. Transc.	Western Transcaucasia
25. E. Transc.	Eastern Transcaucasia
26. S. Transc.	Southern Transcaucasia
27. Tal.	Talysh.
IV. West Siberia	
28. Ob	Ob region (from the eastern slopes of the Urals to the Yenisei R.)

- | | |
|---------------------|-------------|
| 29. U. Tob. | Upper Tobol |
| 30. Irt. | Irtysk |
| 31. Alt. | Altai |

V. East Siberia

- | | |
|-----------------------|-------------------|
| 32. Yenisei | Yenisei |
| 33. Lena-Kol. | Lena-Kolyma |
| 34. Ang.-Say. | Angara R. -Sayans |
| 35. Dau. | Daurai |

VI. Far East

- | | |
|---------------------|-------------|
| 36. Kamch. | Kamchatka |
| 37. Okh. | Okhotsk |
| 38. Ze.-Bu. | Zeya-Bureya |
| 39. Uda | Uda R. area |
| 40. Uss. | Ussuri |
| 41. Sakh. | Sakhalin |

799 VII. Soviet Central Asia

- | | |
|-------------------------|----------------------------------|
| 42. Ar.-Casp. | Aral-Caspian |
| 43. Balkh. | Lake Balkhash area |
| 44. Dzu.-Tarb. | Dzungaria-Tarbagatai |
| 45. Kzy. K. | Kyzyl-Kum |
| 46. Kara K. | Kara-Kum |
| 47. Mtn.-Turkm. | Mountainous part of Turkmenistan |
| 48. Amu D. | Amu Darya |
| 49. Syr D. | Syr Darya |
| 50. Pam.-Al. | Pamir-Alai |
| 51. T. Sh. | Tien Shan |

Accepted Regions for Indication of General Distribution of
Species Appearing in "Flora of the U.S.S.R."

- | | |
|---------------------------|---|
| I. Arc. | - Arctic (Spitzbergen, Greenland and farther) |
| II. Scand. | - Scandinavia (Norway, Denmark, Sweden, Finland) |
| III. Centr. Eur. | - Central Europe (Germany, Poland, Czechoslovakia, Hungary, Austria, Switzerland) |
| IV. Alt. Eur. | - Atlantic Europe (Holland, Belgium, England, France, Portugal) |
| V. Med. | - Mediterranean (including North Africa) (V' Western, V'' Eastern) |
| VI. Bal.-As. Min. | - Balkan Peninsula and Asia Minor |
| VII. Arm.-Kurd. | - Lesser Armenia and Kurdistan |
| VIII. Iran. | - Iran and Afghanistan |
| IX. Ind.-Him. | - India and Himalayas |
| X. Dzu.-Kash. | - [Dzungaria-Kashgar area] Eastern or Chinese Turkestan (Sinkiang) |
| XI. Mong. | - Mongolia |

XII. Jap.-Ch.	- Japan and China
XIII. Ber.	- North American coast of the Bering Sea
XIV. N. Am.	- North America (U.S.A. and Canada)
XV. Tib.	- Tibet

Other Geographical Abbreviations

Afr.	Africa
Aust.	Australia
Centr.	Central
E.	East(ern)
Gr.	Great, Greater
Is.	Island, Islands
Mt.	Mount
Mts.	Mountains
N.	North(ern)
R.	River
S.	South(ern)
W.	West(ern)

ALTERNATIVE SPELLINGS AND ABBREVIATIONS OF AUTHORS' NAMES

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Grossgeim, A. A. (Grossg.)	Grossheim, A. (Grossh.)
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Lipskii, V. I.	Lipsky, V.
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Shmal'gauzen, I. F. (Shmal'g.)	Schmalhausen, I. (Schmalh.)
Vol'f, E. L.	Wolf, E.

EXPLANATORY LIST OF ABBREVIATIONS OF RUSSIAN
INSTITUTIONS AND PERIODICALS APPEARING
IN THIS TEXT

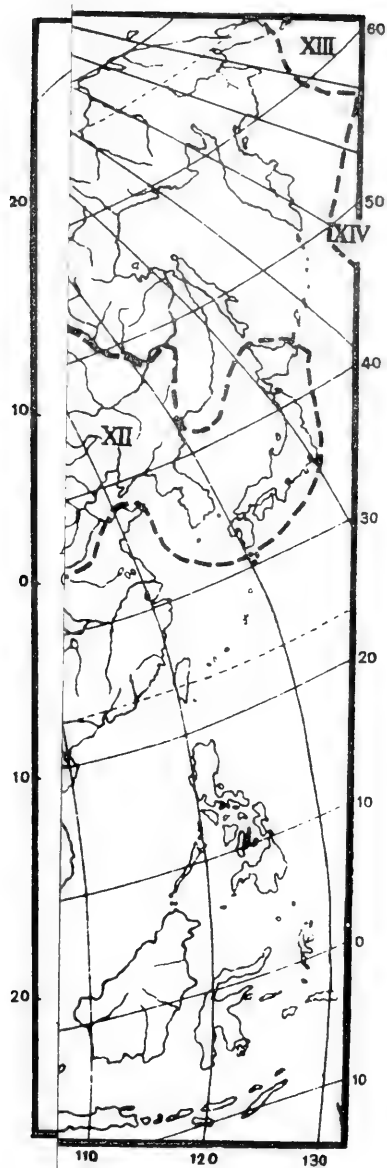
Abbreviation	Full names (transliterated)	Translation
Bot.-geogr. issled. v Turkest.	Botaniko-geograficheskie issledovaniya v Turkestane	Botanical and Geographical Investigations in Turkestan
Bot. Mat. Gerb. Bot. inst. AN SSSR	Botanicheskie Materialy Gerbariya Botaniches- kogo instituta AN SSSR	Botanical Materials of the Herbarium of the Botanical Institute of the Academy of Sciences of the USSR
Bot. Mat. Gerb. Gl. Bot. Sada	Botanicheskie Materialy Gerbariya Glavnogo Botanicheskogo Sada	Botanical Materials of the Herbarium of the Main Botanical Gardens
Bot. zap. SPb. univ.	Botanicheskie zapiski Sankt-Peterburgskogo universiteta	Botanical Notes of St. Petersburg University
Bot. zhurn. SSSR	Botanicheskii zhurnal SSSR	Botanical Journal of the USSR
Byull. Glavn. Bot. Sada	Byulleten' Glavnogo Botanicheskogo Sada	Bulletin of the Main Botanical Gardens
Byull. Obshch. lyubit. estest- vozn., antrop. i etnogr.	Byulleten' Obshchestva lyubiteli estestvozna- niya, antropologii i etnografii	Bulletin of the Naturalists', Anthropologists' and Etnographers' Society
Dendr.	Dendarii	Arboretum
Der. i kust.	Derev'ya i kustarniki	Trees and Shrubs
Der. i kust. Kavk.	Derev'ya i kustarniki Kavkaza	Trees and Shrubs of the Caucasus
Dikie polezn. i technich. raste- niya SSSR	Dikie poleznye i tekhnichesk- skie rasteniya SSSR	Wild Useful Plants and Industrial Crops of the USSR
Dikorastuchchie r. Kavkaza, ikh rasprostranenie, svoistva i pri- menenie	Dikorastushchie raste- niya Kavkaza, ikh ras- prostranenie, svoistva i primeneniye	Wild Plants of the Caucasus, Their Distribution, Properties and Uses
Dokl. AN Azerb. SSR	Doklady Akademii Nauk Azerbaidzhanskoi SSR	Reports of the Academy of Sciences of the Azerbaijan SSR
Fl.	Flora	Flora
Fl. Abkh.	Flora Abkhazii	Abkhazian Flora

Fl. Almat. zapovedn.	Flora Alma-Atinskogo zapovednika	Flora of the Alma-Ata Reserve
Fl. Alt.	Flora Altaya	Altai Flora
Fl. Alt. i Tomsk. gub.	Flora Altaiskoi i Tomskoi gubernii	Flora of Altai and Tomsk Provinces
Fl. Az. Ross.	Flora Aziatskoi Rossii	Flora of Asiatic Russia
Fl. Evrop. Rossii	Flora Evropeiskoi Rossii	Flora of European Russia
Fl. Gruzii	Flora Gruzii	Georgian Flora
Fl. Kamch.	Flora Kamchatki	Kamchatkan Flora
Fl. Kavk.	Flora Kavkaza	Caucasian Flora
Fl. Man'chzh.	Flora Man'chzhurii	Manchurian Flora
Fl. Sev. Kraya	Flora Severnogo Kraya	Flora of the Northern Territory
Fl. Sib.	Flora Sibiri	Siberian Flora
Fl. Sib. i Dal'n. Vost.	Flora Sibiri i Dal'nego Vostoka	Flora of Siberia and the Far East
Fl. Sr. Ross.	Flora srednei Rossii	Flora of Central Russia
Fl. Talysh.	Flora Talysha	Talysh Flora
Fl. Yugo-Vost.	Flora Yugo-Vostoka	Flora of the Southeast
Fl. Zap. Sib.	Flora Zapadnoi Sibiri	Flora of West Siberia
Gerb. donsk. fl.	Gerbarii donskoi flory	Herbarium of Don Flora
Gerb. Orlovsk. gub.	Gerbarii Orlovskoi gubernii	Herbarium of Orel Province
Gerb. Ukr. fl.	Gerbarii Ukrainskoi flory	Herbarium of Ukrainian Flora
GRF	Gerbarii Russkoj Flory	Herbarium of Russian Flora
Ill. Fl. Mosk. gub.	Illyustrirovannaya Flora Moskovskoi gubernii	Illustrated Flora of Moscow Province
Izv. AN SSSR	Izvestiya AN SSSR	Bulletin of the Academy of Sciences of the USSR
Izv. Bot. Sada	Izvestiya Botanicheskogo Sada	Bulletin of the Botanical Gardens
Izv. Bot. Sada Petra Vel.	Izvestiya Botanicheskogo Sada Petra Velikogo	Bulletin of Peter the Great Botanical Gardens
Izv. Gl. Bot. Sada	Izvestiya glavnogo Bota- nicheskogo Sada	Bulletin of the Main Botanical Gardens
Izv. Kavk. Muzeya	Izvestiya Kavkazskogo Muzeya	Bulletin of the Caucasian Museum
Izv. Kazakhst. fil. AN SSSR	Izvestiya Kazakhtan- skogo Filiala Akademii Nauk SSSR	Bulletin of the Kazakhstan Branch of the Academy of Sciences of the USSR
Izv. Kievsk. Bot. Sada	Izvestiya Kievskogo Botanicheskogo Sada	Bulletin of the Kiev Botanical Gardens
Izv. Obshch. lyubit. estest- vozn., antrop. i etnogr.	Izvestiya Obshchestva lyubiteli estestvoznaniya, antropologii i etnografii	Bulletin of the Naturalists', Anthropologists' and Etnographers' Society
Konsp. rast. okr. Khar'kova	Konspekt rastenii okruga Khar'kova	Compendium of Plants of Kharkov
Korm. rast. estestv. senoko- sov i pastb. SSSR	Kormovye rasteniya estestvennykh senokosov i pastbishch SSSR	Fodder Plants of Natural Hay-meadows and Pastures of the USSR

Lesn. zhurn.	Lesnoi zhurnal	Forestry Journal
Mat. (dlya) Fl.	Materialy dlya Flory	Materials on Caucasian Flora
Kavk.	Kavkaza	
Nov. obozr.	Novoe obozrenie	New Review
Och. obozr. i fl.	Ocherki rastitel'nosti i	Survey of Carpathian
Karpat	flory Karpat	Vegetation and Flora
Ocherk. Tifl. fl.	Ocherki Tiflisskoi flory	Survey of Tiflis [Tbilisi] Flora
Opis. Amur. obl.	Opisanie Amurskoi oblasti	Description of the Amur Region
Opred. der. i	Opredelitel' derev'ev i	Key to Trees and Shrubs
kust.	kustarnikov	
Opred. rast.	Opredelitel' rastenii	Key to Plants of Far Eastern
Dal'nevost. kr.	Dal'nevostochnogo	Territory
	Kraya	
Opred. rast. Kavk.	Opredelitel' rastenii	Key to Caucasian Plants
	Kavkaza	
Opred. vyssh.	Opredelitel' vysshikh	Key to Higher Plants
rast.	rastenii	
Opred. (vyssh.)	Opredelitel' (vysshikh)	Key to Higher Plants of the
rasten. Evrop.	rastenii Evropeiskoi	European USSR
chasti SSSR	chasti SSSR	
Perech. rast.	Perechen' rastenii	List of Turkmenian Plants
Turk.	Turkmenii	
Putesh.	Puteshestviya	Travels
Rast. i fl. Karp.	Rasteniya i flora Karpat	Plants and Flora of the Carpathians
		Vegetation of Gandzha [now Kirovabad] Summer Pastures
Rast. letn. pastb.	Rasteniya letnikh	Plant Resources of
Gandzh.	pastbishch Gandzhi	Turkmenia
Rast. res. Turkm.	Rastitel'nye resursy	Plant Resources of the
	Turkmenii	Caucasus
Rast. resursy	Rastitel'nye resursy	Vegetation of Siberia
Kavkaza	Kavkaza	Vegetation of Soviet Central
Rast. Sib.	Rastitel'nost' Sibiri	Asia
Rast. Sr. Az.	Rastitel'nost' Srednei Azii	Vegetation of the Caucasus
		Plant Cover of the Eastern
Rastit. Kavk.	Rastitel'nost' Kavkaza	Pamirs
Rastit. pokrov.	Rastitel'nyi pokrov	Plant Resources of
vost. Pamira	vostochnogo Pamira	Kazakhstan
Rastit. syr'e	Rastitel'noe syr'e	Results of Two Travels to
Kazakhst.	Kazakhstana	the Caucasus
Rezult. dvukh	Rezultaty dvukh	
puteshestv. na	puteshestvii na	
Kavk.	Kavkaz	
Russk. Fl.	Russkaya Flora	Russian Flora
Russk. lek. rast.	Russkie lekarstvennye	Russian Medicinal Plants
	rasteniya	
Sbor, sushka i	Sbor, sushka i razvitie	Gathering, Drying and
raz. lek. rast.	lekarstvennykh rastenii	Development of Medicinal Plants
Sorn. rast. SSSR	Sornye rasteniya SSSR	Weed Plants of the USSR
Sov. Bot.	Sovetskaya Botanika	Soviet Botany
Spis. rast.	Spisok rastenii	List of Plants

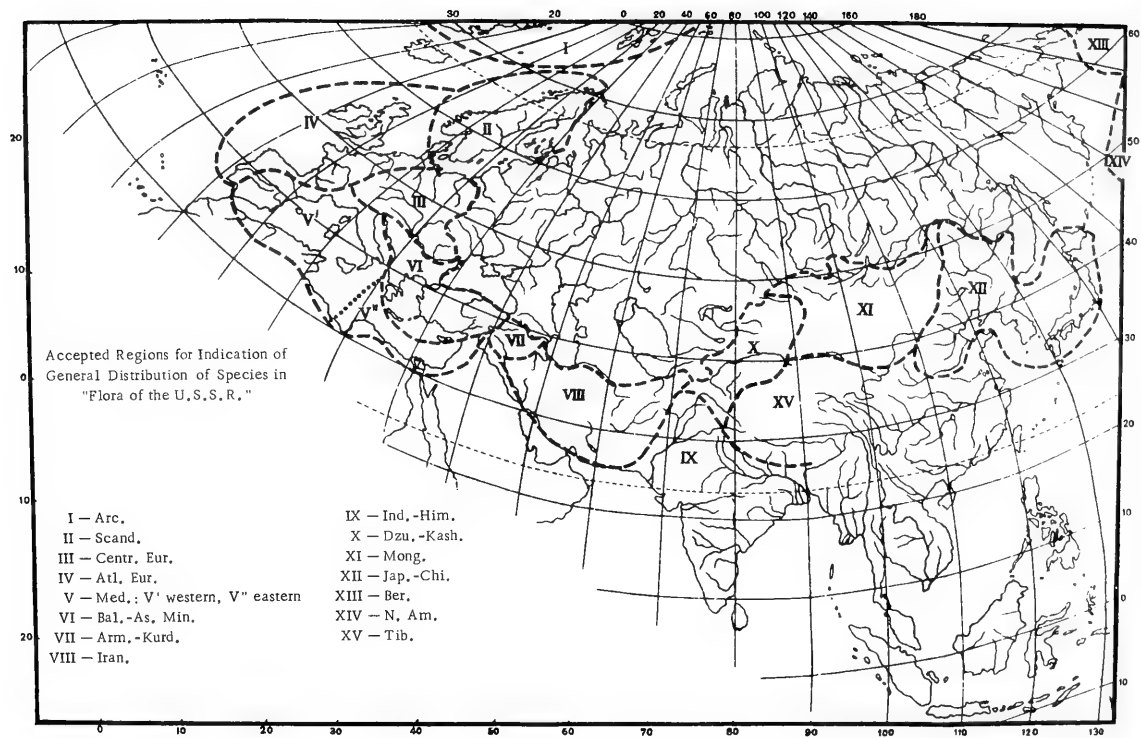
Tr. Bot. inst. AN SSSR	Trudy Botanicheskogo instituta AN SSSR	Transactions of the Botanical Institute of the Academy of Sciences of the USSR
Tr. Bot. Sada	Trudy Botanicheskogo Sada	Transactions of the Botanical Gardens
Tr. Bot. Sada Yur'evsk. Univ.	Trudy Botanicheskogo Sada Yur'evskogo Universiteta	Transactions of the Botanical Gardens of Yur'ev [now Tartu] University
Tr. Dal'nevost. bazy AN SSSR	Trudy Dal'nevostochnoi bazy AN SSSR	Transactions of the Far Eastern Base of the Academy of Sciences of the USSR
Tr. Inst. nov. lub. syr'ya	Trudy Instituta novogo lubyanogo syr'ya	Transactions of the Institute of New Fiber Raw Materials
Tr. Obshch. isp. prir. Khar'k. univ.	Trudy Obshchestva ispytatelei prirody Khar'kovskogo universiteta	Transactions of Naturalists' Society of Kharkov University
Tr. Peterb. obshch. estestvoisp.	Trudy Peterburgskogo obshchestva estestvoispytatelei	Transactions of St. Petersburg Naturalists' Society
Tr. pochv.-bot. eksp. Peresl. upr.	Trudy pochvenno-botanicheskoi ekspeditsii Pereslavskogo upravleniya	Transactions of the Soil-Botanical Expedition of Pereslavl Administration
Tr. po geobot. obsled. pastb. Azerb.	Trudy po geobotanicheskim obsledovaniyam pastbishch Azerbaidzhana	Transactions of Geobotanical Investigations of Azerbaijan SSR Pastures
Tr. prikl. bot. (gen. i sel.)	Trudy po prikladnoi botanike, genetike i selektsii	Transactions of Applied Botany, Genetics and Selection
Tr. Ross. Obshch. sadov.	Trudy Rossiiskogo obshchestva sadovodov	Transactions of the Russian Horticulturists' Society
Tr. SAGU	Trudy Sredneaziatskogo Gosudarstvennogo Universiteta	Transactions of the Soviet Central Asian State University
Tr. Sarat. obshch. estestvoisp.	Trudy Saratovskogo obshchestva estestvoispytatelei	Transactions of the Saratov Naturalists' Society
Tr. Sil'sko-gospod. komit. bot.	Trudy sil'skohospodar'skoho komiteta botaniky	Transactions of the Botanical Agricultural Committee
Tr. SPb. obshch. estestv.	Trudy Sankt-Peterburgskogo obshchestva estestvoispytatelei	Transactions of the St. Petersburg Naturalists' Society
Tr. Tadzh. bazy AN SSSR	Trudy Tadzhikskoi bazy AN SSSR	Transactions of the Tadzhikistan Base of the Academy of Sciences of the USSR
Tr. Tbil. bot. inst.	Trudy Tbiliskogo botanicheskogo instituta	Transactions of Tbilisi Botanical Institute

Tr. Tbil. (or Tifl.) bot. sada	Trudy Tbilisskogo (Tifliskogo) botaniche- skogo sada	Transactions of the Tbilisi (Tiflis) Botanical Garden
Tr. Turkmensk. bot. sada	Trudy Turkmenskogo botanicheskogo sada	Transactions of the Turkmenian Botanical Garden
Tr. Turk. nauchn. obshch.	Trudy Turkmenskogo nauchnogo obshchestva	Transactions of the Turkmenian Scientific Society
Vest. Akad. Nauk (or AN) Kazakhsk. SSR	Vestnik Akademii Nauk Kazakhskoi SSR	Bulletin of the Academy of Sciences of the Kazakh SSR
Vestn. estestv. nauk	Vestnik estestvennykh nauk	Bulletin of Natural Sciences
Vestn. Ross. Obshch. sadov.	Vestnik Rossiiskogo obshchestva sadovodov	Bulletin of the Russian Horticulturists' Society
Vest. Tifl. bot. sada	Vestnik Tiflisskogo botanicheskogo sada	Bulletin of Tiflis Botanical Garden
Vizn. (or Vznachn.) rosl. URSR	Viznachnyk rosl.yn USSR	Key to Plants of Ukrainian SSR
V obl. polupustyni	V oblasti polupustyni	(In the) Semidesert Region
Yadov. rast. lugov i pastb.	Yadovitye rasteniya lugov i pastbishch	Poisonous Plants of Meadows and Pastures
Zam. po sist. i geogr. rast. Tbil. bot. inst.	Zametki po sistematike i geografii rastenii Tbilisskogo botaniche- skogo instituta	Notes on Taxonomy and Geography of Plants of the Tbilisi Botanical Institute
Zhurn. Bot. obshch.	Zhurnal Botanicheskogo obshchestva	Journal of the Botanical Society
Zhurn. opytn. agron. Yugo- Vost.	Zhurnal opytnoi agronomii Yugo-Vostoka	Journal of Experimental Agronomy of the Southeast



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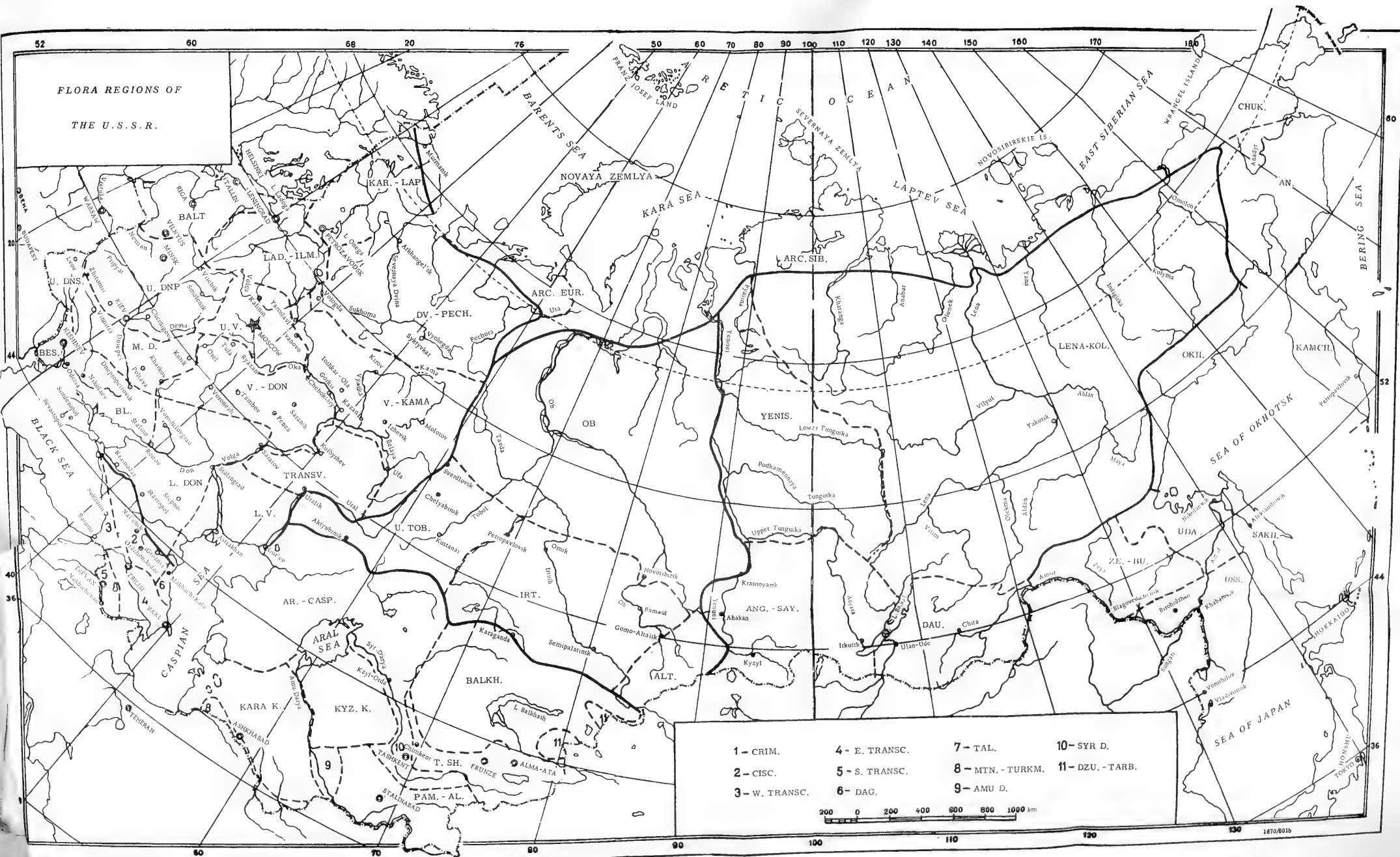
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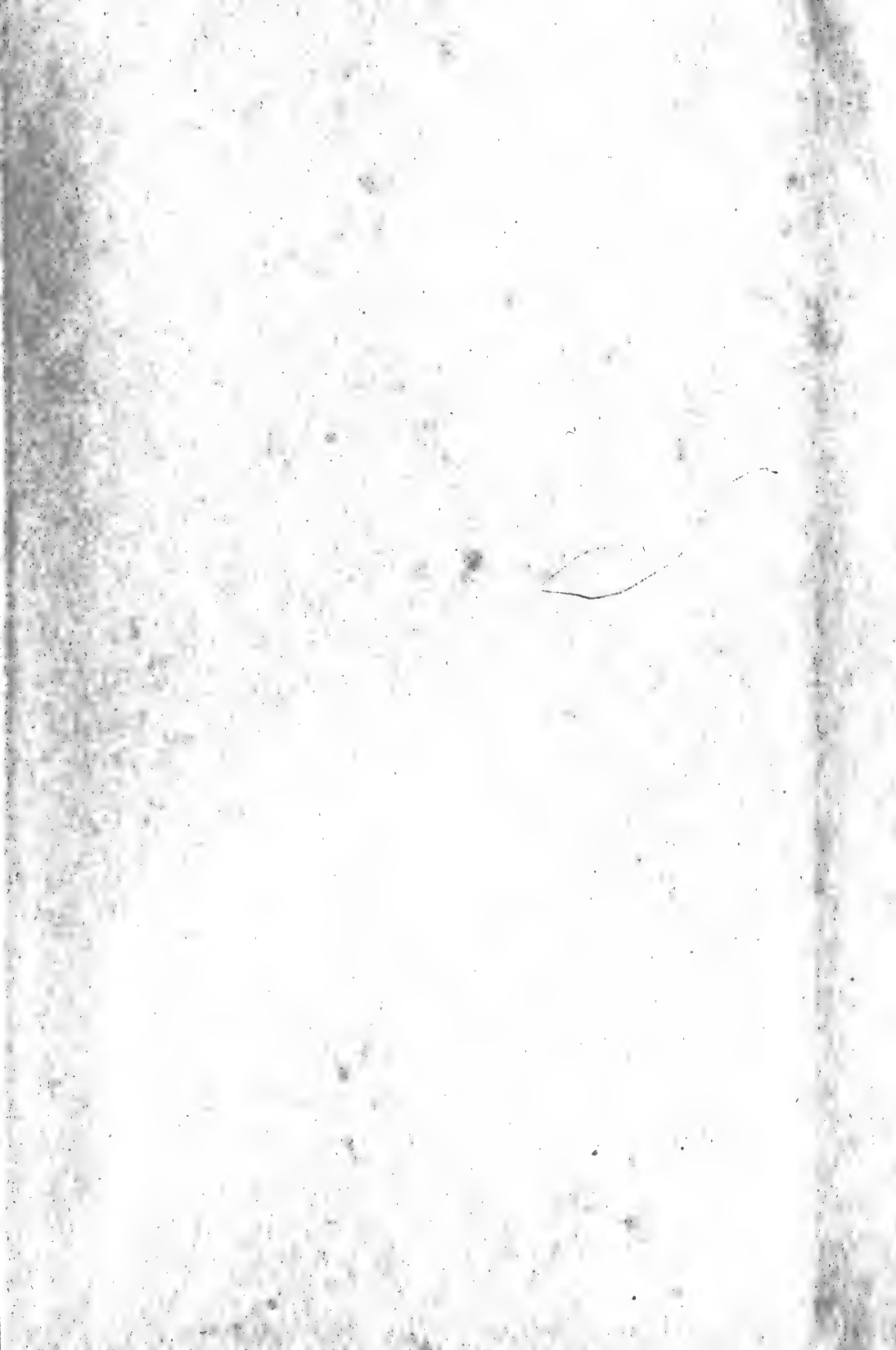
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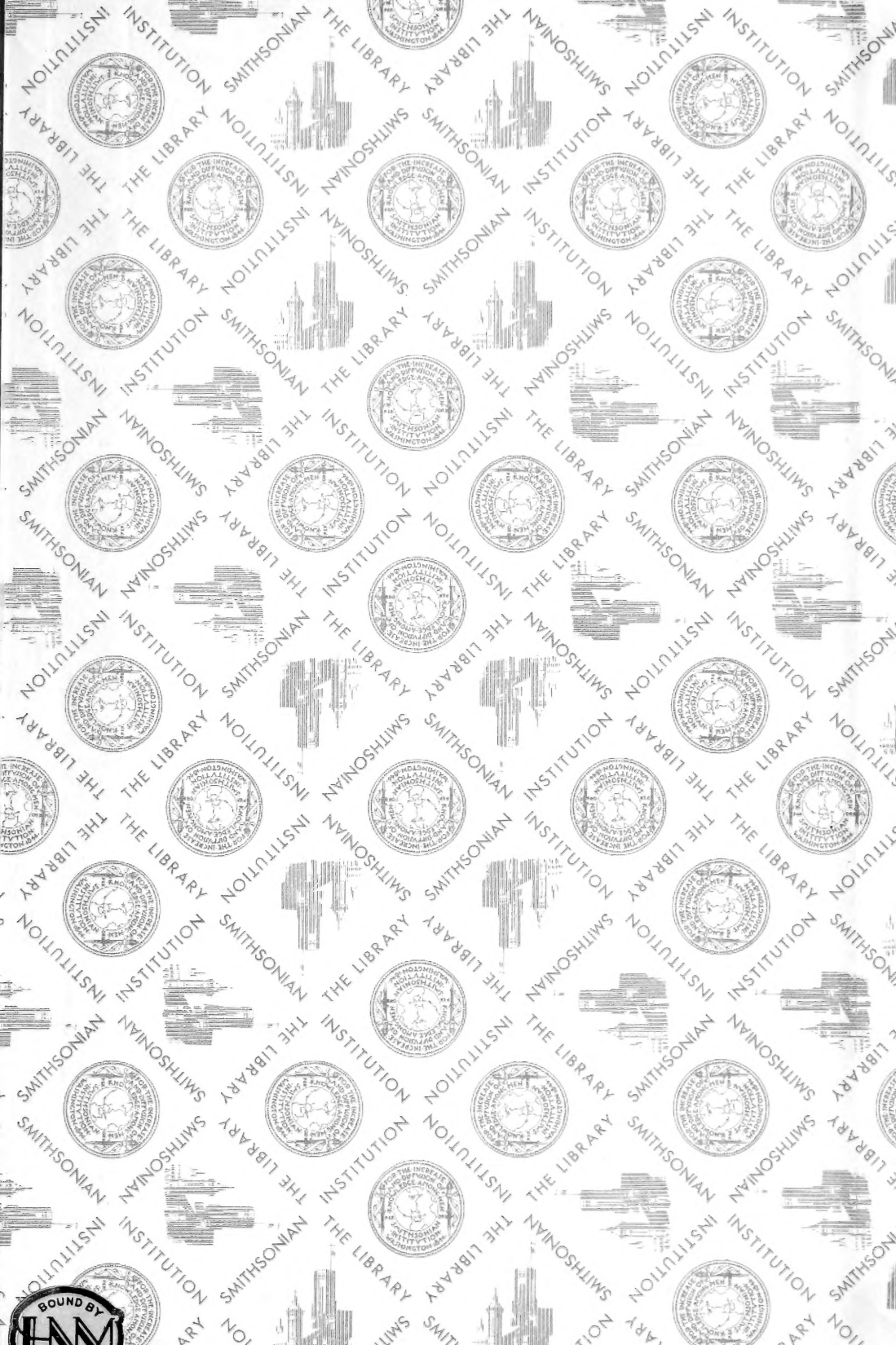












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